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The Outlook

Combing Their Tails

MANY people may have been puzzled by a typical Churchillian remark in the Prime Minister's recent speech to the House of Commons. Dealing with man-power, Mr. Churchill said that he had thought for some time that the Army and the Air Force (the Navy not so much) had a great need to what he would venture to call comb their tails in order to magnify their teeth.

Everyone has learnt by now that it takes a considerable number of men on the ground to keep one aircraft in the air, and certainly it would be very false economy to cut down the numbers of essential tradesmen. Nor is much saving possible in such trades as batmen, cooks and butchers, and the like. Nevertheless, a definite economy in man-power is always taking place in the R.A.F. as its organisation develops.

The expansion of the Air Force has led to the construction of many new aerodromes, and the hurried evacuation of the squadrons from France accentuated the temporary strain on R.A.F. organisation at home. When a new station is opened it is necessary to ensure that the number of ground men is not under-estimated, and therefore it will at first probably be over-estimated. As things settle down the precise number required becomes clear, and any surplus is then transferred.

The growing efficiency of the Air Force will also result in a saving of men without any particular effort at tail-combing. Not only are new squadrons being formed, but the policy is to increase the number of machines per squadron. That, of course, does not lead to an increase in headquarters staff, as happens when a new unit is formed, and so more machines are put into the air without a corresponding increase in the number of men. The introduction of larger bombers will have the same effect. If one says, for example, that a two-engined bomber will carry one ton of bombs while a four-engined machine will carry five tons, then to drop those five tons on Germany would in one case call for ten fitters and in the other case for only four, with savings as well in riggers and aircraft hands.

The S.A.A.F. Over Abyssinia

WHEN the Italians held all Libya and had pushed forward for a short distance into Egypt, it was possible for them to maintain a certain degree of communications by air with Abyssinia. It was not too easy, and implied flights, by night for the most part, by long-range bombers, but it could be done. Now that the Italians have lost possession of all their aerodromes to the east of Benghazi, besides losing large numbers of their aircraft, it is doubtful whether any air contact with Abyssinia is at all possible. At any rate, reinforcement on a large scale of the contingents of the *Regia Aeronautica* in the conquered country must be out of the question.

This fact gives additional value to the series of raids which the South African Air Force has been undertaking against the aerodromes and other places in Ethiopia. Every Italian machine there which is bombed or machine-gunned now is an irreplaceable loss to the enemy. The spectacle must also be a great encouragement to the Abyssinian patriots. They remember well the part played by the Italian Air Force in the invasion of their country, and the brutal use of mustard gas from the air, against which they had no sort of protection. It must give intense pleasure to the people of the country to see aircraft now fighting on their side and taking vengeance on the Force at whose hands they once suffered so cruelly.

The South African airmen can get great satisfaction from their raids, for it is seldom the case that the destruction of enemy aircraft on the ground has such a definite result in weakening the enemy.

Can It Be Done?

THE suggestion put forward several months ago by Captain Norman Macmillan in his series of articles in *Flight*, that the British aircraft factories should be transferred, lock, stock and barrel, to British Dominions, was received with scepticism. We ourselves commented on it adversely, arguing that the shipping required, not to mention the interruption of production which would inevitably occur, would be prohibitive.

It now appears that Australia has been thinking along somewhat similar lines, for according to the Canberra correspondent of *The Times*, the Australian Prime Minister, after discussion with the members of the War Council, is about to submit to the British Government plans for transferring to Australia a considerable part of the aircraft manufacturing plant of the United Kingdom.

Mr. Menzies evidently takes the view that the war will last for years, otherwise the suggestion would be little short of fantastic. But even if it is assumed that a protracted war is certain, it is difficult to agree that such a scheme might be practicable. The amount of shipping which would be entailed would be prodigious, and at present, and for some time to come, we have none to spare if an adequate supply of war materials and foodstuffs is to be assured.

It might be argued that if some of these supplies were diverted to Australia, they would require no greater tonnage, and that the food supplies needed would be reduced in proportion to the number of aircraft workers with their families who were transferred to Australia. That would not be quite true, because only, or at least mainly, aircraft materials would be sent to Australia, while numerous other war necessities would obviously still have to come to this country. Already many months ago it was announced officially that more than 100,000 people were engaged on aircraft construction. The figure must by now be several times greater. But even if only a proportion of aircraft workers were transferred, and the equipment of only a percentage of the works, the shipping task would be gigantic. When details become known, it will, perhaps, be found that the Australian scheme visualises a *gradual* transfer. For that there is much to be said—if the war is to be a long one.

Good Team Work

THE campaign in Libya is an outstanding example of co-operation between the three fighting Services. The Royal Navy has swept the seas clear of enemy surface warships, the Royal Air Force has swept the skies over the desert clear of Italian aircraft, and the Army continues to ply the broom on the ground troops of the once redoubtable Marshal Graziani. Not only has each Service done its own bit of work to perfection, but the work of all three has been so dovetailed together that the result has been sheer perfection. Had one of the three been less adequate than it was, things would not have gone so well.

In contrast to this extraordinary display of team work the Axis is apparently trying to reverse the decision by reliance on the air arm alone. Mussolini has asked Hitler for help, and Hitler has sent him bombers. Those bombers have had a success by destroying a cruiser and damaging an aircraft carrier, and they may further cause annoyance to the Allied forces in the Mediterranean theatre. It is by no means a certainty, or even a probability, that German bombers will get the better of the R.A.F., but even if they reduced the mastery which the latter has established, that would not be final. Hitler doubtless recognises that, and so it is not surprising that there is a threat of intervention by the German Army. It may advance in the spring. If it does, it will only add to the Axis force the second element of the three which we have used to bring success. The combination of three successful Services, which has served us so well, is not a possibility for the Axis.

GOOD HOLLANDERS: Pilots of the Royal Dutch Naval Air Service operating with the R.A.F. The yellow triangle on the nose of the Hudson denotes the nationality.

War in the Air

Capture of Derna: Advance on Four Fronts: Fog in North Europe

(British Movietone News)

***ARK ROYAL* AT SEA: The famous British aircraft carrier photographed in the Mediterranean from one of her aircraft.**

SIR ARCHIBALD WAVELL is striking out vigorously on four fronts, Libya, Eritrea, Abyssinia, and Somaliland, and everywhere is pressing the retreating Italians hard. In Libya—it is pleasing to recall how for many months the reports from that front spoke of "the Western Desert"; now they speak of "Libya"—British troops have stormed Derna after a three-days' fight. Australians again struck the final blow. The seaplane base at Bomba, which lies between Tobruk and Derna, was found to have been completely destroyed by the bombs of the R.A.F. When our men entered the place they found the graves of a few Italian pilots, the burnt-out wreckage of seven seaplanes, and the twisted girders of two workshops, and that was all. Two of the seaplanes, three-engined machines, were lying in shallow water, still attached to their moorings, and riddled with bullets.

In some ways the British advance into Eritrea is the most interesting, as this is the oldest Italian colony in Africa and contains the important port of Massawa. A seaport on the Red Sea is not of much value to the Italians at present, though some of their submarines may use the place, but the loss of Eritrea would hit Italian pride very hard. The Indian division, which did gallant work on the Libyan front during the early operations round Sidi Barrani, has been diverted into Eritrea. As usual, the Indian division includes some British regiments, and one of them is stated to be a famous Highland regiment. This division has been fighting its way gallantly towards the important town of Agordat. A Rhodesian squadron has been giving support to the ground troops, and, among other exploits, its aircraft dropped bombs near a bridge at Tellina, hit another west of Keren, shot up motor transport at various places, and bombed a landing ground. The fighting has been taking place in rocky hills, a style of warfare similar to that experienced by the Indians on the North-West Frontier. Information from the air as to the enemy's positions is of the greatest moment in such operations, and the eyes of the Rhodesian observers may well be of greater service than the bombs and bullets discharged from the machines.

The South African Air Force units are operating from Kenya against Italian Somaliland, and in Abyssinia.

From Albania the news of late has been scanty, and actually all other news from Greece has been overshadowed by the death of the able and patriotic Prime Minister, General Metaxas. He it was who defied the aggression of Fascist Italy, and it is understood to have been he who planned the campaign which has been carried out in such masterly fashion by the Greek Army. At any rate, it was he who reformed and trained the Army and put a stop to the idea that an Army may be a political party. His loss is great, but the major part of his work has been done and he has died at the height of his glory. As the King of the Hellenes said: "He has left our midst to enter that place where the glorious figures of Greek history are gathered together."

Other figures, it is reported, have

(British Movietone News)

Governor of Algeciras visits H.M.S. *Ark Royal* at Gibraltar. Spanish officers of the Governor's party being shown a torpedo-bomber on the flight deck.

WAR IN THE AIR (Continued)

left their accustomed places, not in glory, but for other reasons. It is not yet sure whether all the rumours are correct, but they include the dismissal of Marshal Graziani from the command in Libya and the appointment of General Bardi as his successor. It would be strange if Graziani were to be left in command, for seldom has a General of repute conducted a campaign in a more incompetent fashion. It is also stated that Count Ciano, Italy's Foreign Minister and the son-in-law of Mussolini, has left the Government to take command of a bomber unit in Albania. He commanded the Desperata Squadron during the Italian conquest of Abyssinia, and much publicity was given to the raids in which he took part. As there was no air defence, the risks which he ran were merely those of flying over mountainous country. Other Italian Ministers are also said to have been dismissed from their posts and sent to the front in Albania, but when rumours of that sort become too wholesale, they should be received with caution. At any rate, we may be sure that Signor Mussolini is not too happy about things in general, and when the tyrant is in ill humour some of his underlings are certain to suffer.

Perhaps another result of the Duce's displeasure has been some renewed activity on the part of the *Regia Aeronautica*, both in Libya and in Albania. It must have been almost a surprise for the R.A.F. pilots to encounter Italian fighters and bombers in the air again, but the mastery of the air by the R.A.F. was not seriously disputed. In Albania especially the Italian Generals must be cursing the futility of their air arm, for their recent operations indicate curiosity as to where the main strength of the Greeks is situated. They are trying to find this out by probing at the Greeks with ground troops at different points along the line. The aircraft ought to be able to supply the information, but evidently they are not able to do so. This cannot be entirely due to the weather, as the R.A.F. and the Greek pilots are not kept aground, though they sometimes confess inability to see the exact results of their bombing raids on Elbasan and other places.

A Rough Time

ALTHOUGH R.A.F. losses in Libya have been small, war flying there has not been all joy-riding. After a series of remarkable adventures during which he displayed great fortitude, the rear-gunner of a R.A.F. bomber is now safe in hospital recovering from wounds received when his aircraft crashed into the sea. This sergeant gunner was a member of the crew of a bomber raiding Tobruk. The aircraft was hit by anti-aircraft fire but carried on the raid. On the return journey, while over the sea, however, the starboard engine of the aircraft burst into flames. The pilot immediately warned the crew that he was going down to attempt to alight on the sea, and he ordered them to their emergency stations. The aircraft stalled from about fifty feet and crashed into the sea. The rear-gunner and another member of the crew were at the time standing amidships. The next thing the rear-gunner knew was that he was lying on top of the fuselage with his legs in the water. He had been thrown out of the aircraft and knocked unconscious, but had fortunately landed on the fuselage instead of in the sea. Another member of the crew had released the rubber dinghy and was attempting to right it. There was no sign of life from inside the aircraft, which suddenly sank, leaving the two airmen with the dinghy, which they were unable to right. The sergeant was suffering from a deep head cut sustained when he was miraculously thrown safely through the top of the fuselage, and one arm was practically useless. He decided that despite the nasty swell running at the time, his best course was to attempt to swim to the shore half a mile away. His colleague elected to stay with the dinghy, as he knew he could not swim the distance.

Saved at Last

THE rear-gunner made the trip successfully, but collapsed on the beach and lost consciousness. When he recovered he searched frantically for the dinghy, but could find no trace of it. His one obsession was to find help, so he began to walk inland, for he knew he was well inside friendly territory. Throughout the night he plodded on, but to his dismay found himself, two or three hours after daybreak, back at approximately the same spot on the coast from which he had started. Again he searched for the dinghy, and this time he found it, with the dead body of his colleague lashed to it. The latter's final attempt to save his own life had been in vain. Parts of the wrecked aircraft had been washed ashore.

Once more the sergeant set off to search for assistance. This time he took the precaution of maintaining his direction by the wind, which was blowing off the sea. All day he staggered on without meeting a soul, and just before nightfall he found a stone enclosure with a number of small rooms, one of which was partly filled with straw. It had apparently been occupied by Italian or British troops. He slept during the night in the straw, and set out again in the morning in a last desperate effort to find help, as he had had neither food nor water. Some faint car tracks gave him renewed hope, and he stuck grimly to these until

WHITE CAMOUFLAGE : A Wellington I.A. with engine warming covers on, picketed out in the recent snow.

WAR IN THE AIR (Continued)

BACK TO AULD REEKIE: No. 603 (Edinburgh) Squadron has returned to its native heath after bagging over 100 enemy machines during the autumn air battles. The pilot in the centre has 10 to his credit.

at last he came upon a road. His trials were over, for he was picked up by a passing convoy and rushed to the nearest casualty clearing station.

As January drew to a close the German bombers began to show rather more activity over Great Britain than they had displayed for some weeks previously. The weather had been wet and foggy, and that doubtless kept them aground, as it also put a check on the offensive of the R.A.F. Bomber Command. On more than one day, when London was enveloped in fog, isolated German bombers flew over and dropped bombs. It must have been quite impossible for the airmen to see any targets at all, but this blind brutality is typical of Axis warfare. There has also been some night bombing of a similar character.

Bombing Without Engines

ON many sides the belief is expressed that Hitler will before long order a definite start to be made in the invasion of Great Britain. The thick weather may have given a chance to the Germans to get on with preparations at the ports where they have been massing men and barges, and as the British bombing of their aerodromes also had to be discontinued for a while, numbers of squadrons may have been accumulated there. The said invasion ports have been very thoroughly hammered, and facilities at them for embarkation cannot be all that the Germans would desire. A pilot of a Blenheim bomber which had been on a night raid over Brest recently broadcast the following story of his adventures. His story well shows the grit with which the R.A.F. men drive home their attacks. It ran in the main as follows:—

"That night we were just making an ordinary night attack on Brest harbour. We'd been there before, and we knew roughly what to expect. There was a bright moon when we got near the place, and the *flak*—the anti-aircraft fire—was coming up in much the usual sort of way. There were curtains of fire here and there, cones of fire over the more important spots and searchlights wandering all over the place. It was pretty cold, but you expect it to be cold at the height at which we were flying. Then suddenly the port engine stopped. My observer, who was in the nose of the aircraft, switched on the intercommunication telephone and asked what had happened. 'Port engine stopped,' I told him. Then, just as I said it, most of the noise died out of the aeroplane, and I said, 'Gosh, starboard engine stopped, too!' 'Well, here we go,' said the observer, and that was all you *could* say about it. Both engines had iced up and stopped, and we were gliding, without any power, slowly downwards.

"I was not particularly worried at first. Engines do sometimes ice up and stop, and when you come down into warmer air, with any luck they pick up again. My only worry was to travel as slowly as possible, so that the glide would last as long as possible. The observer and I had a chat about it and decided that, as we were already over Brest, we might as well have a smack at the target, even without any engines. The *flak* had died away for the moment, so we started our first run in. By then we had lost about a thousand feet in height.

"We made a run across the target area but we couldn't see the exact target we wanted, so we came round again and started another run, a few hundred feet lower. And we kept on doing that, a bit lower each time, for what seemed about ten years—although really our whole glide lasted for less than a quarter of an hour. By this time, of course, the German gunners knew we were there, and now and then they seemed to have a pretty good idea exactly where we were. There was one particularly nasty burst of *flak* all round us when we were about half-way down, and it shook the aircraft a bit, but we weren't hit. Every now and then a searchlight picked us up and I had to take avoiding action to get out of it. I didn't want to do that more than I could help, because every time I did it we lost a little more height.

"By the time we were down to about 4,000 feet, still without any engines, things began to look rather nasty. We were still gliding, and still making our runs over the target area, with the observer doing his best to get the primary target into his bomb sight—and, of course, we were still losing height. To add to our worries, another Blenheim high above us, without the slightest idea that we were below, was dropping flares and lighting the place up. When we had lost another thousand feet we ran slap into the middle of trouble. The *flak* came up like a hailstorm going the wrong way. But even then, by a stroke of luck, nothing hit us. A little lower, however, our luck broke. The port wing stopped an explosive shell, which tore a hole two feet square in it. I called to the observer to get rid of the bombs on something useful, because we hadn't got enough height to go round again. The observer released the bombs, and they fell near the entrance to the Port Militaire—and still we were gliding downwards.

Just in Time

"BY now we were so low that we could see almost everything on the ground and in the harbour. I took one quick look over the side, but one look was enough. The tracer fire was coming up so quickly at us that I had to rely on the observer to direct me through the various streams of it. I had no time to watch it myself. Right over the middle of the harbour, at just about 1,000 feet, we were caught in a strong blue searchlight—and almost simultaneously both our engines picked up again. I raced out of the harbour, through even more violent *flak*, fortunately without being hit again.

"All the way home I had to keep the control wheel hard over to the right to hold the damaged wing up, and several times the observer had to come back to help me hang on to the wheel, the pull was so heavy. We made for the nearest aerodrome in England.

"That aircraft is now in service again. The engineers worked on it night and day and, thanks to them, within three days I flew it back to my own aerodrome.'

WAR IN THE AIR (Continued)

AIR LOSSES TO FEBRUARY 1.

	GERMAN	BRITISH		MIDDLE EAST	
				Enemy	British
	Aircraft	Aircraft	Pilots	Aircraft	Aircraft
Jan. 26	—	—	—	6	1
,, 27	1	—	—	—	—
,, 28	—	—	—	17	—
,, 29	—	—	—	2	1
,, 30	1	—	—	1	—
,, 31	2	—	—	7	—
Feb. 1	—	—	—	2	—
	—	—	—	—	—
	4	0	0	35	2

No British bombers were lost during the week.

German losses by R.A.F. and ground defences in Northern Area, 4,208. R.A.F. aircraft lost in Northern Area, 1,714.

In the Middle East the R.A.F. have destroyed about 749 enemy aircraft and have lost 91.

Bad news comes thick and fast to Signor Mussolini. Hard on the heels of the messenger who brought the tidings of the fall of Derna (supposing that it was a messenger and not a telephone call) came another to tell that the Indian division had captured Agordat, in Eritrea. It can hardly have been a surprise, for the Italian troops on that front have been resolutely retreating for some time past. The tidings cannot have been any the sweeter for that. The town is an important railway centre, lying on hills some 1,800ft. high. From there the railway line descends to Asmara, the capital of the colony, and to the port of Massawa. Our troops thus command the main line of communications in the country. The other British column in Eritrea is nearing the town of Barentu, to the south. Eritrea lies along the north-eastern border of Abyssinia, and the news of the British advance must have spread like wildfire through that country; in fact, many Abyssinians may well have witnessed some of the fighting. Their exultation can be imagined.

Help from the Bombers

AT Derna the Italians put up a rather stouter fight than their comrades had done at either Bardia or Tobruk. The reason given for that is that the men of the Derna garrison had not before been in action against the British and did not know beforehand what grand fighters they had against them. The Australians naturally suffered some casualties, and so did the other British troops, but the victory was very complete.

One Australian soldier has told a Press correspondent of an attack which his regiment was making on an aerodrome lately. The place was strongly held with guns which outranged the light weapons which the Australians had with them. Consequently their advance was slow. Presently, to their delight, some R.A.F. bombers flew over and dropped bombs on the defences. That threw up a lot of dust and drove the gunners to cover for a while, and before the dust had died down the Australians had rushed forward for a considerable distance. When they got close the Italians evacuated the aerodrome and retired. It was a small incident, but showed how useful bombers can be in a land battle when there is no chance of bringing up artillery in time.

British mechanised forces lost no time in pressing on to the west of Derna. That town "divides the desert from the sown." It is itself a pleasant spot, with palms and other vegetation growing, and to the west of it the country is no longer mere sand. Our troops will appreciate that, even though the broken nature of the land is said to favour defence.

In Albania the Greeks have been pressing cautiously forward, and by the time these words are published the Italians may have evacuated the town of Tepelini. The R.A.F. have been raiding Valona again, and a Greek submarine has sunk a substantial Italian transport off Brindisi. One must admire the modesty of the official Greek communiqués. They never err on the side of exaggeration, and usually it turns out that the troops have done more than the communiqués have claimed. That is not the way of the Axis official statements.

Raiding Invasion Ports

DESPITE the unfavourable weather of late, the R.A.F. Bomber Command has contrived to do some raiding. Wilhelmshaven and Brest have been raided again by night, and Boulogne and Ostend before dawn. Naturally, at this time, with so much talk in the air about an imminent invasion, attention has been concentrated on naval bases and ports from which the invasion might start. That is sound tactics. If the invasion were to succeed, it would not then matter whether the production of German munitions had been delayed or not. There have also been more expeditions by British fighters over parts of Northern France.

This war cannot be studied entirely from the air point of view, for in British strategy all three Services must combine. A great deal of interest attaches to Hitler's attempt to make the Vichy Government conform to his will. Undoubtedly he hopes to get possession of the remains of the French fleet, and with it cut the British control of the western Mediterranean. If he had both Toulon and Bizerta in his hands, he might cause us considerable inconvenience. The sinister figure of Laval is backing the German plans, but at the moment of writing the aged Marshal who is head of the Vichy Government has shown no signs of descending to the infamy of allowing French warships and French naval bases to be used against the former Ally of France. It is also reported, and it bears the stamp of truth, that among the French people sympathy is growing for the fine movement for which General de Gaulle stands.

General Weygand has broadcast to the soldiers in French Africa asking them for blind trust. But those troops can feel little love for the Italians just across the frontier, who have faced them for so long. They will have heard of the gallant exploit of the Free French Camel Corps from Chad, and they must have been stirred by it.

SECOND EDITION OF "FLIGHT" HANDBOOK

AS the first edition had completely sold out, and as many new technical developments had occurred since it was written a comparatively short time ago, it was necessary to bring out a second edition of the popular "Flight Handbook." This book, which is written by Mr. W. O. Manning and the Technical Staff of *Flight*, compresses within its conveniently small size a wealth of information on nearly every technical aspect of aeronautics, certainly every one of those which interests "the ordinary individual who wishes to obtain a working knowledge of this most complex of engineering sciences, but without recourse to a study of mathematics or other scientific knowledge." This phrase is an extract from the foreword written by Mr. Griffith Brewer, president of the Royal Aeronautical Society, who also writes, "It is not a textbook on aerodynamics or structures, but it does serve as an introduction to a more advanced study of the science of flight by giving general ideas about all problems connected with aviation."

The second edition has been completely revised and enlarged by 37 pages so as to include such modern developments as the terrain clearance indicator, ducted cooling, shaft drive, geodetic construction, nosewheels, barrage balloons, feathering airscrews, artificial horizon, exhaust gas analyser, automatic pilot, instrument landing systems, plastics and pressure cabins. The chapters contained in the Handbook have the headings: First Principles, Aerodynamics, Aircraft Structures, Gliders, Balloons and Airships, Airscrews, Instruments, and a new chapter has been added on Modern Developments. In addition to the numerous diagrams and photographs with which it is illustrated, there are four special double-page constructional drawings of modern civil and military aircraft, including the now world-famous Spitfire. This handy-size book—it will go in the pocket for a railway journey—has 84 pages and is obtainable at most bookshops at the reasonable price of 4s. It may also be obtained from *Flight*, Dorset House, Stamford Street, London, S.E.1, for 4s. 5d. posted.

LOAD FACTORS IN GUSTS

Piloting Procedure in Rough Weather : The V-G Recorder : Pull-out Tests

THE U.S. Civil Aeronautics Board has issued a report, principally for the information of pilots, on why and how air loads are encountered by aeroplanes when they fly into gusts. Written by Francis R. Shanley, of the Aircraft Airworthiness Section, the report is No. 7 of the series prepared for the Civilian Pilot Training Programme. The paper sets out to present the theory of load factors due to gusts in a simplified manner, and a brief summary of it follows hereunder.

If an aeroplane is in straight and level flight, it is flying at a load factor of 1. That is to say, it is developing an upward aerodynamic Lift on its surfaces exactly equal to its Weight, which acts downward. Load Factor is, of course, Lift/Weight.

But if the aeroplane now enters a sharp-edged current of air flowing upward (an up-gust), the angle of incidence of the wing is increased and the Lift is thereby increased. Thus the aeroplane starts to accelerate upwards and the Load Factor is increased above 1. *For a given forward speed and a given gust speed, the increase of Lift will be directly proportional to the wing area. Therefore, the increase in Load Factor (bearing in mind the above definition) is inversely proportional to the wing loading.*

So considering two different aeroplanes which are both flying into the same gust, and are both loaded to their normal flying weight, that one which has the lower wing loading will experience the higher Load Factor and the greater acceleration. But one must not fall into the error of thinking that by reducing the load carried by an aeroplane and then flying it into a gust that the stresses to which the wing structure are subjected will thereby be increased. The reverse is the case, and the stresses in the gust are reduced by lightening the load. This is so because the increased Lift on the wings in entering the gust is the same, but the Lift on the wings in the straight flight previous to encountering the gust was lower.

Therefore, to reduce stress on an aeroplane it is sound to reduce its load when flying in gusty air. But it is also true that an aeroplane designed with a heavier wing loading is more able to resist gust effects than one designed with a light wing loading.

Effect of Air Speed

Load factor added by a gust does not increase as the square of the airspeed, as might be expected. This is so because increase of forward speed reduces the effective angle of incidence at which the wing meets the gust. *The nett result is that the added load factor is directly proportional to the aeroplane's airspeed.* So it becomes necessary to specify a maximum speed in connection with gust load factor requirements.

Conversely, if an aeroplane has been designed for a certain gust velocity at a given forward speed, it is capable of withstanding higher speed gusts at lower forward speeds

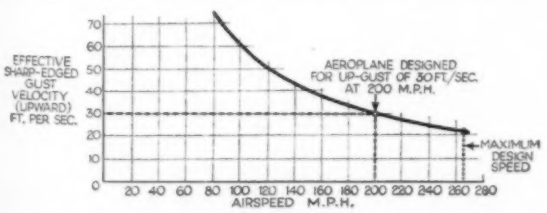


Fig. 1. An aeroplane designed for a certain gust velocity at a definite forward speed can withstand higher gust velocities at lower forward speeds, and vice versa.

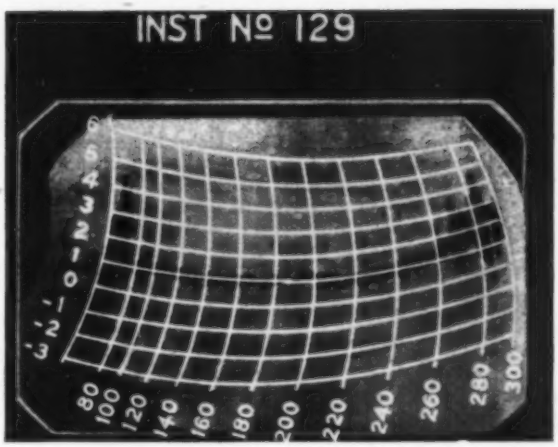


Fig. 2. Actual trace on a V-G recorder installed on a D17S Beechcraft for diving tests. Load factors are given vertically, airspeed horizontally.

with the same safety, and vice versa. (This effect is seen in Fig. 1.) From this springs the safety precaution—*in gusty weather which is so fierce that the structure of the aeroplane seems in danger, reduce speed.*

Reducing the weight of an aeroplane will not always permit operations at higher gust speeds, since this weight is probably all removed from the fuselage and there may be other parts of the structure, such as the engine mounting, whose load has not been reduced, and these may be critical.

The elementary conception for gust formulæ has been based on the idea that a gust is absolutely sharp-edged, and that the aeroplane is out of it at one instant and completely in it at the next. This is not quite true, and there is a transition stage or "gradient" between the area of zero vertical velocity and that of the fully developed gust. So the aeroplane feels the effect of the gust not quite instantaneously, though in many cases nearly so.

The V-G Recorder

Research work has been done on gusts and statistics have been collected from numerous flights to determine the gust velocity which may be regarded as the reasonable maximum which is likely to be encountered under various conditions of flight. The accelerometer alone is not an adequate instrument for this purpose, as angle of incidence cannot be deduced from its readings. But by coupling the accelerometer to the airspeed indicator so that simultaneous readings are obtained on two ordinates at right angles, all aerodynamic quantities and load factors can be obtained.

Such an instrument is known as a V-G recorder, and gusts and all about them can be studied by means of it. By installing such an instrument on an aeroplane, the gusts encountered may be studied and the maximum "effective sharp-edged gust" velocity determined. Information on which to base the design specifications of the future is thus stored up.

The V-G recorder is also used in test-flying, and Fig 2 shows an actual trace of such a recorder installed in a D17S Beechcraft for diving tests. The load factor is recorded vertically and the forward speed horizontally by the pointer, this being able to move in both directions. The figure 1 on the vertical scale corresponds to straight and (vertically) unaccelerated flight. The load factor on the aeroplane is 1. The figure 2 indicates that the aeroplane is now being accelerated vertically upward at a value of 1*g*, that is, approximately 32ft. per sec. per sec., and its load factor is 2. (It should be clearly noted that acceleration in terms of *g* is not synonymous with load factor.)

The figure 0 indicates the aeroplane is being accelerated downward at the rate of 1*g* and that the load factor is zero. Under these circumstances the pilot is just on the point

LOAD FACTORS IN GUSTS (Continued)

of leaving his seat—his pressure upon it is zero. Below the o line he would be pulling upward on the safety belt.

The main trace of the record between 75 and 260 m.p.h. shows flight at increasing forward speed but with no vertical accelerations except the ones due to small atmospheric bumps always encountered. But at 260 m.p.h. the nose was put down and the pilot's seat was relieved of his weight, the load factor being o. The aeroplane was then dived at an increasing speed and the stick pulled back as 270 m.p.h. was reached, so causing a load factor of 3.7.

Other tests were done and the aeroplane successfully withstood load factors of 4.7 at 285 m.p.h. and 3.2 at 300 m.p.h. These are high load factors for a civil aeroplane to have to withstand, the design assumption for which in this country is that the aeroplane shall be designed to break at exactly twice the maximum load which it may reasonably be expected to encounter.

The traces at the left end of the record are due to the bumps experienced during taxying or take-off, and it will be seen that they are quite large, reaching a maximum of 4.5 This makes one realise very clearly that great stresses can be imposed on undercarriages when on the ground.

CANADIAN AVIATION NEWS

New Factories : Testing Vidal Plastic Process : Civil Aviation Statistics

TWO new aircraft plants are being built in Canada, one near London, Ontario, to cost about $3,000,000, being built by the Canadian Government for a Government-owned company, and the other at Vancouver, being built at a cost of $1,355,000 to be operated by Boeing Aircraft of Canada. What types are to be built at these two plants has not yet been announced.

* * *

Exclusive manufacturing rights have been obtained by the Canadian Government for the manufacture in Canada of aeroplanes using the Vidal plastic process. Two aeroplanes are now undergoing tests at Ottawa, and, if successful, aircraft with plastic fuselages, wings and tail assemblies will be produced in Canada, according to Ralph Bell, Canadian Government director-general of aircraft production. The exclusive rights for Canadian production were obtained after Dean C. J. Mackenzie and J. H. Parkin, acting president and director respectively of the Canadian National Research Council, reported to the Government on the Vidal process.

* * *

Canadian civil aviation during the first nine months of 1940, according to a report issued by the Department of Transport, Ottawa, showed 737 private pilots with licences in force, 147 commercial pilots, 261 limited commercial pilots, 145 transport pilots, 782 air engineers, and 36 airport traffic control officers. There were at September 30, 1940, 69 private planes licensed for service, 460 commercial aircraft, and 113 airports. International traffic at Montreal, Winnipeg and Vancouver checked 1,450 Canadian aircraft in and out, 4,800 United States aircraft, 34,600 passengers, 22,000lb. of freight and 168,000lb. of mail in and out. Air mail carried during the first half of 1940 is reported on 52 services amounting to 1,350,000lb. Flying clubs during the first nine months of 1940 flew a total of 36,470 hours, training 171 for their private pilot licences, and 53 for commercial. During the first two quarters of the year the clubs had 104 aircraft in use, but during the third quarter only 55. Similarly, membership dropped from nearly 2,700 during the first three months to just under 1,600 during the summer months, due to some of the clubs suspending civilian activities for the duration of the war.

* * *

New international mail and passenger runs starting early in the New Year as a result of agreements between Ottawa and Washington include routes starting in February by Trans-Canada Air Lines from Toronto to New York and from Detroit to Canadian points. United States airlines will run new routes from Bangor, Maine, to Moncton, New Brunswick, to be operated by Northeast Airways, from Buffalo to Toronto, from Windsor, Ontario, to United States points, and from Great Falls, Montana, to Lethbridge, Alberta. For these last three routes no company has yet been named.

BOOK REVIEWS

"Flight from Youth," by William E. Barrett. 7s. 6d. Peter Davies.

HERE is a novel about the reincarnation of a young R.F.C. pilot who was shot down in flames in April, 1917, written by a man who is an authority on aircraft of the 1914-1918 period, many of which he himself flew. Mr. Barrett, therefore, makes none of the little errors with which so many novelists annoy us when they allow their characters to venture into a world with which they themselves are not too familiar. But the author of this strikingly original story brings far more than mere technical knowledge to bear upon his work, for he has a style which is masterly in its simplicity and the mental reactions and feelings of the fighting pilot can rarely have been more successfully expressed. He shows, too, a word-economy in his descriptive passages which greatly enhances their dramatic strength, as, for example, when the present-day young American recounts his last moments in the little Nieuport over the German lines. It was in a "dog-fight" with an Albatross.—"For a moment I yawed wildly as I over-ruddered and something hit me below the shoulder-blade. It was cold and hard like an ice-packed snowball and the breath left my lungs with the shock of it. I felt my mouth lock in a ghastly yawn and the stick jerked from my fingers. I reached for it and could not find it. . . . . I no longer knew where my hand was. . . . . I found my breath again and my mouth closed. I stared straight ahead and there was a scarlet pennant flying on my nose . . . the pennant waved twice before I knew what it was. Then it rushed towards me in a solid wall of flame. I stared at it . . . . . and that was all."

But the yarn is not all flying. There is the girl whom he had loved and for whom he wanted to live in 1917 and when, as a present-day youth, complete memory of his true identity returns to him—he confirms his R.F.C. recollections by turning up the back files of *Flight*—he seeks her out again. She is now a woman of forty, but so is the real man in the youth's body. Altogether it is a fascinating and splendidly written story.

The Spotter's Handbook. By Francis Chichester. (George Allen and Unwin. 5s.)

ROOF-SPOTTING has become such a vitally important matter that it is rapidly developing into a definite science. This is as it should be, since the spotter has great responsibilities. Upon his efficiency may depend not only the lives of hundreds of workers beneath his roof, but what is equally important, the saving of hundreds of precious "man-hours" in the nation's war effort. This book aims at helping the spotter to attain efficiency, and its author is amply qualified to supply the valuable information it contains. The first thing the reader will discover is that there is much more to this spotting business than might be at first supposed. Identification of friend from foe in the air is the main task, but by no means the only one. He deals, for example, with the valuable information which gunfire can convey if the spotter knows how to interpret it. He recommends, incidentally, that spotters should not be employees of the factory for which they are spotting and that their decisions should never be questioned by the management. It may also be mentioned that Mr. Chichester's method of teaching identification tallies with the principles adopted by *Flight* in the new "Friend or Foe?" series, and he emphasises a point which was stressed in the first article of this new series, namely, that the spotter should not be burdened with any more information on the technicalities of aircraft than is absolutely necessary. The author's sketches follow this rule, and his grouping of types likely to be mistaken for each other is, of course, particularly helpful. It will be a most useful handbook for all those who have to decide if an aircraft be hostile or friendly and to access, quickly and accurately, the degree of threatened danger.

DUTCH AIRMEN IN BRITAIN

Adventures of Some Netherlands Pilots to Serve with R.A.F.

By HENRY BAERLEIN

IN comparison with the Polish and Czech airmen, whose brilliant and valuable activities in association with the R.A.F. are by this time common knowledge, very little has been heard by the general public of the work that is being done by the Dutch airmen in this country. During a recent visit to a station of which these sturdy fellows occupy a part, I was given an insight into their operations.

One had heard that the sudden invasion of Holland by the Germans had been so overwhelming that the whole of the Netherlands Air Force was destroyed. But that was too dark a picture. In Holland there existed no separate air force; one part of it was attached to the army and another to the navy. It was the former which suffered much more severely at the hands of the Nazis, and this in spite of the fact that the Dutch, guided by lessons learned in Norway, had taken the precaution of leaving no machines in the hangars, but had placed them alongside the landing fields, on near-by roads and on auxiliary aerodromes prepared with the greatest possible secrecy. Thanks to these measures the result of the early bombing attacks on hangars was negligible.

Machines Saved

On the other hand the German machine-gun attacks on the Dutch aircraft left out in the open, before they were all able to take off, disabled a great number of them. Unfortunately the Dutch had not yet been able to complete the measures planned after the invasion of Norway for the protection of their flying fields; had these measures been ready they would have made it exceedingly difficult for the enemy to gain a foothold there, as Mr. van Kleffens, the Netherlands Foreign Minister, has pointed out in his most interesting book *The Rape of the Netherlands*. Alas, the detachments guarding the aerodromes were an easy prey for the low-flying German aircraft sent to destroy them. With the aid of parachutists, who cleared away the obstacles on these fields as soon as they had been landed, three aerodromes round the Hague fell early the first morning into the hands of the enemy, who at once started landing numerous troop-carrying machines on the spaces cleared.

ANGLO-DUTCH : A Fokker T.W.8 torpedo plane bearing the R.A.F. roundels over the Netherlands triangle of orange.

The naval air force, on the other hand, managed to rescue a good many of its seaplanes. The older types had been deposited in places where the Germans would expect to find them, whereas those of a more modern type were concealed in remoter lakes and in similar places. Thus it was possible for them, sometimes with a load of airmen well exceeding their official capacity, to come over to Britain. And for a time these planes were employed by our Dutch allies in this country. But there is always the question of spare parts, as some of us found in the other war when our hastily converted cars of the British Ambulance Committee included one or two Mercedes and some Belgian cars, so that our workshop staff had on occasion to exercise all their ingenuity. They were relieved when the whole outfit was provided with Austin cars, and similarly the Dutch relinquished their seaplanes in favour of the twin-engine British bombers which, in their own admiring words, bristle with machine-guns.

Everybody knows how excellent was the passenger line of the K.L.M. to the East. The machines were the last word in efficiency. But the Dutch civilian pilots were not alone in being acquainted with the varying conditions to be encountered in European and Asiatic flights. A large proportion of the Dutch navy has always been based upon Holland's magnificent colonial empire, so that the navy's flying personnel were men of more than average experience. Seeing that the actual aviators in this branch of the navy entered it as a career—while the ground staff were conscripts who served for a much shorter period—it is not surprising that they did not take long to become accustomed to their British aircraft. A rating airman would remain with the colours up to the age of 45, while for warrant officers the retiring age is 50 and for officers 55.

"We had been used to flying three-engined machines," remarked a Squadron Leader, "and they needed more control than these twin-engined bombers. Moreover, these beautiful machines are so easy to manœuvre, so utterly reliable."

In calling this gentleman a Squadron Leader I am following the example of his British colleagues, who, for operational purposes, convert the naval ranks of these officers into the equivalents in our Royal Air Force. A great many countries have not yet

THE RIGHT TYPE : An air-gunner of the Royal Dutch Naval Air Service operating with the R.A.F.

DUTCH AIRMEN IN BRITAIN (Continued)

given special designations to their airmen. These Dutch flying officers in consequence wear naval uniform, with the addition of a wing and also a distinguishing disc that indicates whether the officer is a pilot or an observer, or both. The men—one cannot help being impressed by their physique, their obvious capacity of endurance, and their high spirits—have by this time been arrayed in British uniforms with an indication of their nationality. It has been possible to provide them with a separate kitchen where cooks from the Netherlands prepare the food in the fashion that these men prefer. This helps to alleviate the nostalgia they must now and then feel in being cut off from communication with their homeland, so that they can only hope that their families survive.

Walked to Lisbon

Another officer, a keen-faced naval engineer, was smiling reflectively. "If," he said, "I may put in a word, I can give you an example of one of our men in this squadron who hails from Rotterdam, which was so mercilessly devastated by the Germans. He had witnessed the slaughter of his parents, his wife and his children, and that only made him the more determined to carry on the struggle. It was necessary for him to reach a port and get to England; the nearest port for that purpose turned out to be Lisbon. So he walked from Rotterdam to Lisbon! By day he used to hide himself and sleep, while at night he plodded on and on. I should have mentioned that he did not walk quite all the way, because he came across a dead German by the side of his motor cycle. He made off on the cycle and was shot by another Dutchman who took him for a Fifth Columnist. All this has nothing to do with our work at this station, but as you are writing for *Flight* it may be that the Editor also caters for those who are interested in the other sense of that word. I myself am very devoted to the literature of escape."

Believe it or not, that is what he said, so perhaps his familiarity with our language will not be questioned, and most of his colleagues were not far behind him. I asked the engineer whether he himself had been able to come to this country by air.

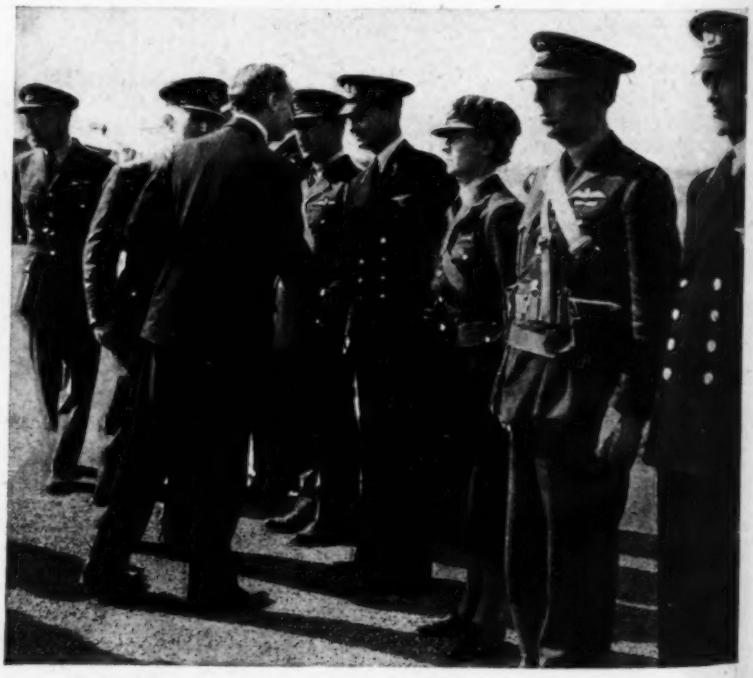
"After that man's Odyssey," he said, "my own journey with a couple of companions is hardly worth talking about. We secured a 30-foot boat and set sail on a dark night. It was rather lonely on the rough sea. We had no map and no compass. England, we knew, was to the west of us and we hoped to be lucky. You will agree that we were, because we came unscathed through a minefield. We had with us a Dutch flag, and as we neared the coast of Britain we waved it. Needless to say, we were received with the utmost kindness."

One of his brother officers then joined in the conversation. "I know," he said, "that you want to know about our work in this country. But how we are being treated here, that is of importance, too, as it naturally affects our morale one way or the other. An aerodrome is usually like this one, a few miles from the nearest town, and the British authorities in such a place have the same problem as ourselves—how to prevent the squadron from becoming bored and then depressed and ultimately less efficient, through having nothing to do in their leisure time. We cannot always be playing chess or dominoes or cards. So we lecture to each other, explaining the political situation and the reasons for which we are here. Some of us have been in parts of the world which are now very much in the news. Of course, we go to the town from time to time—I wish you could mention its name, because the people there have been so kind to us, organising football matches, concerts and dances. We have collaborated a little with our own musical talent."

While he had been talking a Dutch warrant officer had come into the room to look at a notice on the board and had then departed. Very obviously, he was not of unmixed European descent.

"Yes," said one of the group when I enquired about this man, "our Dutch-East Indian can rise to any position. If he has passed through the high school in the East he will go afterwards to the Naval Academy at Den Helder if he hopes to become an officer in the navy. I need hardly tell you that he will have to display not merely the possession of knowledge but qualities of character and leadership. Talking of the East Indies, you may have seen the announcement that we are going to be reinforced by a supply of pilots from there, and very competent fellows they are, of the same high standard as your own Indian airmen. Also, I am glad to say that we are going to receive a large consignment of books from our East Indies—it is being arranged by some wealthy merchants—of course, we are cut off from Holland. In fact, a friend of mine, an airman who has got married here, can only let his mother in Holland know of it by writing to a friend in America and asking him to pass on the information and only to put my friend's nickname—you have to be careful in writing to a country where the Gestapo is in power. But our compatriots who have had to stay at home will often elude them."

"Precisely," laughed one of his companions, "precisely like that man



WITH THE COASTAL COMMAND: Sir Archibald Sinclair talking to a Dutch Squadron Commander on the occasion of a visit to a Coastal Command station.

DUTCH AIRMEN IN BRITAIN (Continued)

of this squadron who eluded a barrage balloon. His propeller," he told me, "cut a way for him. It was a most lucky affair."

"But not more so," said the officer who had spoken before him, "than the fellow of our squadron who gave us all, both British and Dutch, a laugh at the Army's expense. It was like this," he turned to me, "there is a certain stretch of sand on which the Army has put up obstacles with a view to holding up an invasion, and this man came down there after dark and he struck nothing whatever. But I believe the Army's preparations were incomplete at the time, and I would not recommend anyone else to try a landing there."

"Oh, that reminds me," said the engineer-officer, "we ought to show our visitor the parachute department. Our section of this aerodrome is 100 per cent. Dutch, which gives us great satisfaction, and the parachute room is not the least interesting portion of it. Let us go there."

The Parachute House

So we sallied forth and went along asphalt paths between hangars and camouflaged buildings and others in course of erection, so that the general impression was not one of extreme tidiness. That, however, was the first thing that struck me in the parachute house, an oblong shed with many pigeon-holes down one side of it. The presiding genius was himself a neat little Dutchman. I am sure he is most meticulous in keeping the atmosphere of that room at the right degree of warmth and that when he opens a parachute and hangs it up, according to regulations, he sees to it that it remains there for 48 hours.

As we left the shed they told me that this man had come over in a torpedo-boat which, fortunately, contained a most patriotic engine. The ship was extremely crowded, and if a German bomb had fallen on it instead of striking the water very near it there would have been a terrible disaster. As it was, the starboard engine received severe damage. So much so that five months were required to repair it in a British port. But—this is the solemn truth—that most worthy engine continued to function until they reached the harbour.

Under British Fire

And as I took my leave of these stalwart Dutch airmen, I knew that nothing short of a direct hit would ever stop them, even if they cannot always have a flight as calm and steady as they are themselves.

"Well," said one of them, "it is a good thing to be steady in a war. Some of us made our way to the Belgian coast, and there a French officer told us we could have a derelict Danish ship, laden with iron ore. Her speed was five knots, and after she had been bombed it fell to three. Yes, one had to be calm and steady. The pump was attached to the shaft and, therefore, in order to use the pump—the ship was leaking—we had to keep moving, and that was awkward when we arrived outside the English port and were told to stop. Anyhow, the pilot we had taken on board ignored the signal, and so we were fired on by the British!"

"I am sure," said the engineer, "that they missed you on purpose." And then he told me of a Dutch warship at present in a harbour at a considerable distance from there. It would be unjust, he said, not to mention it when alluding to the Dutchmen's part in aerial warfare, for the crew had become quite famous for their skill in bringing down German 'planes. The British commander of the port has thanked them, and one German pilot, at any rate, who came through low clouds on a rainy, windy evening and dropped his bombs on an empty dance-hall, so that a piano was the sole casualty, admitted when he crashed more than a hundred miles away that the fatal damage was done by the men of the ship.

"That," said the engineer, "is a satisfactory example of our team work. Here on this aerodrome we have our teams of four men, and if it is at all possible they always go up together."

U BOAT HUNTERS: Dutch air crews in R.A.F. flying kit. In the background is an Avro Anson.

Buick-built Aero Engines

PRATT & WHITNEY aircraft engines may begin to flow from the Buick plant as well as from the Ford works. Latest news is that the necessary negotiations between the two firms are practically complete. A new plant is to be erected at the Buick factory and the initial order is expected to be for some 5,000 engines.

Aircraft Industry to Australia?

AN ambitious scheme to transfer to Australia the greater part of Great Britain's aircraft production, complete with plant and workers, and possibly their families, has been discussed by the War Council. Such a plan would, if put into effect, have the two-fold advantage of preventing interference by enemy activity and of easing the home food-supply situation. A message from Canberra recently published in *The Times* adds that it is hoped that, should this transfer take place, many of the workmen would remain in Australia after the war.

Australia is working on the production of three types of aircraft at present and the suggested scheme, it is pointed out, would enable her to produce a much greater range, concentrating on the heavier types, which could be flown to England.

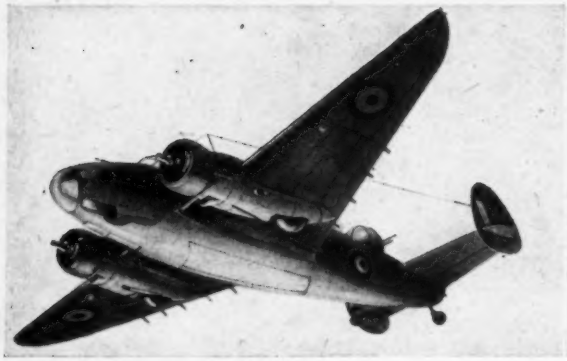
Transport Aircraft from U.S.A.

THE Lockheed Aircraft Corporation has at present 82 transports under construction, of which 42 are their latest model, the Lodestar. This was the number at the date when the Priorities Board ordered commercial deliveries to be stopped. Included among the orders are nine for South African Airways and eight for the British Overseas Airways Corporation, according to our contemporary, *American Aviation*. And in addition to the order for three Boeing Clippers which was lodged recently on behalf of the British Government, another American purchase, has already arrived here and is at work on the Lisbon service. This is *Guba*, the famous Consolidated Model 28 boat which has flown round the world and was used by the Archbold Expedition in New Guinea. *Flight* welcomes her on this side of the Atlantic, particularly as her purchase was advocated in our issue of June 27 of last year.

Fifth of the Series

FRIEND or FOE?

Aid to Aircraft Identification : Two More Opposing Types Compared : Points the Spotter Should Note



Lockheed Hudson Bomber : Radial-engines set close to fuselage. Gun-turret near tail. Twin fins and rudders. Tapering wings. Windows in streamlined nose and long line of windows in cabin. Dihedral begins at fuselage. Wheels visible when retracted.

Messerschmitt Me 110 and Jaguar : Inverted vee engines in streamlined nacelles. Egg-shaped nose to 110 and transparent nose to Jaguar. Twin fins and rudders. Long, straight "cabin-top" above cockpits. Tapering wings. Dihedral starts at fuselage.

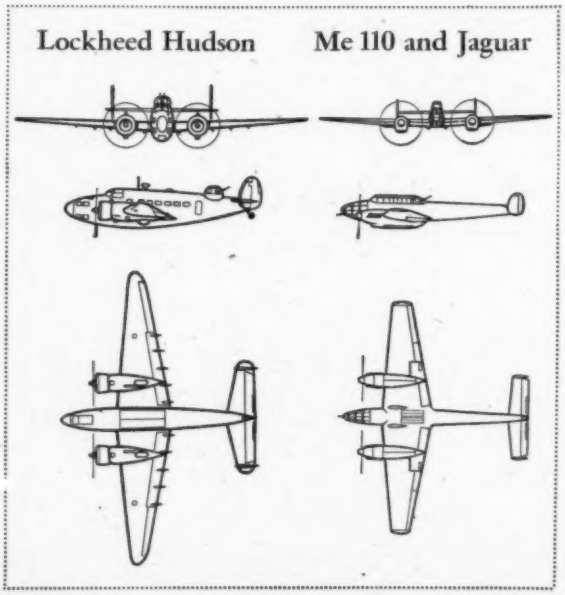
CHIEF points in which the Lockheed Hudson and the Me 110 resemble each other are shape of nose, tapering wing plan and twin fins and rudders. But distinguishing features which should make identification fairly easy if anything like a good view is obtainable are that the American machine has radial engines and a gun turret near the tail, whereas the German is fitted with inverted vee engines and has no separate gun turret, the "rear-gunner" having his post at the aft extremity of the long straight-topped covering over the crew's cockpits. The two machines are surprisingly similar when seen head-on in spite of the engine difference because the nacelles of the Me are well-rounded and the Hudson's radials are of small diameter compared with the average British equivalent. It will be noted, however, that the latter are set much closer to the fuselage than is usually the case.

Side views of these two machines are, however, quite distinctive, the Hudson having a rather short, deep fuselage with a long row of cabin windows reminiscent of the passenger air liner from which it was developed for military purposes. Its upper-line is interrupted by the gun turret just in front of the fin, but the bottom line makes an unbroken, sweeping curve from nose to tail. The Messerschmitt, however, will be recognised from this aspect by its long, comparatively shallow fuselage with the "glasshouse" above the cockpits. The different types of engine on the two machines will also be quite unmistakable from the side view, while it will also be seen that the Lockheed tailplane projects beyond the rudders while the Me's rudders are attached to the tips of the tailplane. "Outrigged" rudders are, in fact, an essentially German characteristic.

Seen in plan, the pronounced taper of the Hudson's wings and tailplane will readily be observed, together with its close-in radial engines. The tailplane of the Me, although tapering a little on its leading edge, is squared abruptly off at its tips by the rudders. It should be noted, incidentally, that the Me Jaguar with the transparent nose is the bomber version and, therefore, a greater menace to those on the ground than the 110, which is employed as a fighter, although the possibility of machine-gunning will not be overlooked in the latter case.

Approaching aircraft are most often seen from a half-front, half-side view, and it is from this angle that another important difference between the Hudson and the Me will be noticed. The bomb-bay on the former curves well below the level of the wing roots, giving the machine a definite mid-wing appearance, but the Me is a true low-wing type so that when the wheels are retracted in flight, the lowest part of the machine is the undersides of the engine nacelles. Yet another wing characteristic of the Hudson is to be seen in the flap-guides which extend behind the trailing edge. There are five on each wing, projecting like the ribs of an umbrella along rather more than half the length of the trailing-edge from the root.

These, however, will only be visible when the machine is almost directly overhead.



Types already compared: (1) Hurricane and Me 109. (2) Spitfire and He 113. (3) Beaufort and Ju 88. (4) Lysander and Hs 126.

Next Week :—Avro Anson and Focke-Wulf Fw 187.

THE LOW COUNTRIES AND FRANCE

The Third Article on the Lessons of the Tactical Employment of Fighters and Bombers in the Present War

By CAPTAIN NORMAN MACMILLAN, M.C., A.F.C.

IT is always difficult to assess current events. More is this so in war than in peace, because of the added interference with the free expression of knowledge, if not of belief. Even the historian cannot always uncover the facts of the past, and this war will provide the historian with the most puzzling elucidatory research of all wars, because of the gallimaufry of propaganda which currently (and intentionally) interferes with the formation of intelligent personal thought. We must thank the development of broadcasting for that. It will be well for the world when we can, after the war, inhume partisan radio propaganda at the transmission end instead of down the earth-lead of the receiver and, to do that, Britain must win the war. Otherwise mankind will suffer the mental plague of an unrestrained Goebbelasian ether.

It is in the full knowledge that it is impossible to tell the whole story that I approach the task of commenting on the lessons of the tactical employment of fighters and bombers in the Low Countries and France during the late spring and early summer of 1940. Nevertheless, it is desirable to explore the subject, even if it is certain from the very outset that one cannot discover all. The period I propose to discuss is the brief interval of 39 days from May 10, when the onslaught on Holland, Belgium and Luxemburg began, until June 17, when Marshal Pétain intervened and asked the German terms for an armistice.

Fundamental Aspects

I am not concerned here with summarising the whole operation. I do not touch upon the *suppressio veri* which helped to bring about the fall of France. I do not propose to argue the inadvisability of the Allied armies' northward movement from a prepared defensive position to unprepared positions when Belgium and Holland called for aid after having rejected prior staff arrangements with the Allies. I am, for the moment, interested solely in the employment of fighter and bomber aircraft on both sides, as far as may be possible in the semi-gloom of the restrictions which apply to the examination of such matters during wartime.

Certain fundamental aspects require statement, but not examination. First, German air strength greatly exceeded the combined air strength of Britain, France, Holland and Belgium. Secondly, control over the whole German air strength was centralised. Thirdly, German air strength was operating offensively. Fourthly, Allied air strength was operating defensively. Fifthly, the air battle zone lay mostly over the territory of the Allies, and, sixthly, it lay outside the British Isles.

Prior to the beginning of the assault, Germany protected her right flank by the occupation of Denmark, but, as far as one can judge, she need not even have troubled to do that. There seems to have been no attempt to counter-attack. The Allies, steeped in the theory that defence was stronger than attack—a theory deriving from the 1914-1918 war—were unprepared for an entirely different form of attack. It does not follow

Sketch map of the area of air operations during the first phase of the Battle of France.

that the theory is wrong, for the tale of the first attempt to invade the British Isles proves otherwise, but there is little doubt that the Allied defence was not framed to meet adequately the kind of attack which the Germans had planned. In considering the theory that the defence is stronger than the attack one must assume that the defence is as modern as the attack in equipment and strategy.

Allies' Deficiency

On the battle area which developed, the Allies were deficient in two forms of tactically mobile equipment—aircraft and tanks. These were the weapons with which they had principally to contend.

(It has been said since the capitulation of France that the French tanks were behind the Maginot Line, while the British heavy tanks were at Aldershot. I have seen neither official confirmation nor denial of this assertion. Nor do I greatly care whether the statement is correct or not. What is important is that, in the criticism which has been levelled at the Allied conduct of that period, little or none has been directed at the handling of Allied aircraft.)

The disposition of the Allied aircraft at the opening of the assault is important. Scant attention appears to have been given (at least outside official circles, wherein, presumably, every lesson which can be learned from the facts of every phase of this war have been conned over and over again) to this aspect of the Battle for France. The preliminary air battle was fought within a large U-shaped area whose sides can be delineated roughly by lines described along the coast of England from Newhaven to Spurn Head as one leg of the U, and by lines from the south-eastern frontier of Luxemburg along the Eastern frontiers of Belgium and Holland as the other leg, with the base of the U formed by the Franco-Luxemburg, Belgian frontier. The Maginot Line lay outside that U-shaped area, a kind of straggling appendage from the lower right-hand leg.

I know it is easy to see things in retrospect. This is an attempt to analyse. It is not designed to praise or blame or to call for other action after the event. From the aspect of air war the Allies cannot claim that they were particularly unfavourably placed. Geographically they were as well situated as the German aircraft. Indeed, the British squadrons based in England were better placed while they remained unmolested by enemy air attack, as apparently they did during the initial phases of the battle. The division of control, however, split the Allied aircraft into a series of scattered units fighting a composite force. Moreover, the German force had the advantage of the initiative, whereas the Allies were opposing a type of offensive whose tactics had not been fully perceived.

The German staff required but one language, the Allies were tri-lingual.. That, superimposed upon the

THE LOW COUNTRIES AND FRANCE (Continued)

absence of previous staff consultations, no doubt added enormously to the difficulty of dealing with a situation whose momentum was terrifically fast. The last edition of the *Handbuch der Luftfahrt* gives the first line strength of the Dutch army air service as 230 aircraft; add to that a few more aircraft in the Dutch naval air service and one has a pretty good idea of the air strength which Germany had to encounter in Holland. The same publication gives the first line strength of the Belgian air force as 310 aircraft, and this figure was probably not very far out.

Against the overwhelming strength of the *Luftwaffe* these two tiny air forces were quickly reduced, for throughout these operations of the German war machine German air strategy appears to have been based on the principle of first overcoming the air-resistance of the enemy. As in Norway, so in the Battle of France, the earliest air attacks were concentrated against aerodromes. Not only were bombing attacks delivered against the aerodromes, but planned attempts were made to capture aerodromes by means of air attack. This manœuvre succeeded in Norway. It was less easy in the Low Countries and the fighting for aerodromes must have cost the Germans heavy losses in aircraft and personnel, for which, no doubt, they were prepared.

Method of Attack

The method of attack was that of the parachutist and the troop transport aircraft. The objective was the same; to secure internal control over a part of the country attacked and to obtain that control behind the defending army. The strategic aim of these tactics was to present the nation attacked unavoidably on a single front, and prepared to resist attack on that front, with a second front for which it was not prepared. By this means it was correctly believed that the frontal attack would be rendered easier of accomplishment as a result of the confusion in the rear.

For this purpose it was essential to use aircraft. Indeed, there was no other means of creating a second front in Holland. The essence of the attack lay in its surprise. After parachute troops had seized the aerodrome of Waalhaven outside Rotterdam, German transport aircraft landed troops rapidly. More transport aircraft landed troops on the beach outside Scheveningen, the pleasure resort close to The Hague. During this manœuvre the German air staff appears to have discounted in advance the high rate of loss in aircraft which must follow such an operation. Dutch troops recaptured Waalhaven, but again it was taken by the Germans from the air.

It is obvious that once an aerodrome is captured supplies can be rapidly dropped to the captors on the ground. Troops can be quickly transported right into the heart of a country. A successful surprise attack of this nature must be worth far more than the number of troops landed would be worth under normal conditions. It is not easy to estimate how great a part this method played in the defeat of Holland in four days, but it must have been considerable. The Dutch air forces were too small to deal effectively with this form of attack.

The complete picture of the first week of the German onslaught is still not clear. It will remain obscure until it becomes possible to obtain all the facts in a connected sequence, but it seems more than probable that it was the success of the initial air attack against the Low Countries which enabled the German ground forces to begin the forward movement which was thereafter to develop so rapidly and end with the capitulation of three countries out of four.

When that forward movement began, the German aircraft tactics altered to those of an army of the air co-operating with the forces on the ground, and during that period the losses inflicted on the German air force by the fighter aircraft of the Royal Air Force based in France mounted. It is not possible for the writer to make adequate comment on the activities of the Dutch and Belgian air forces during the periods before their countries were forced to capitulate to the invader. It would be better and fairer, in any case, for the first account of their activities to come from Dutch and Belgian sources. There can be no doubt, however, that the air-crews of both countries put up a gallant fight against impossible odds, and I personally look forward to an official account of their deeds when it becomes possible to give it in detail.

Fighters at Dunkirk

During this period of the war British and French bombers went into action against the German forces on the ground. Bombers based in England were well situated to go into action. Single-seater fighters based in England, however, appear to have been immobilised until the period of the evacuation from Dunkirk. But then they came into full play. Again, the full story is needed to place the effect of the terrific air fighting for supremacy of the air over the beaches of Dunkirk into its correct relationship in the success of that evacuation. It is certain, however, that on that exposed beach the casualties would have been far greater if the Spitfires and Hurricanes had not sailed into the *Luftwaffe* as they did in spite of colossal odds. The evacuation from the beach solved the difficulty of ports that were unusable through capture, bombing and shelling. One would hesitate to place in their order of merit the work of the rear-guard of the Army, the Navy, the assorted boatmen and the fighters of the Royal Air Force.

Thereafter the work of the Royal Air Force from French bases was almost at its close. After Dunkirk the foiled *Luftwaffe* appears to have been turned again on to the unfortunate French, when both troops and civilians suffered in the same way as had the Belgians beforehand. Without detail to fill in the whole story it is one of the most difficult periods of the war, up to date, upon which to base a positive opinion. None the less, two factors at least stand out as important. One is that the first surprise attack of the *Luftwaffe* against Holland succeeded because it was the first time it had ever been tried in war, and because it could not be countered by a sufficient force of fighters. The lesson appears to be that the best method to counter the attack of parachute troops and air-transport troops is to attack the aircraft in flight, but that the method used must have the effect of destroying the aircraft in a way which will not allow the occupants to escape alive by parachute with their accoutrements. That means that the aircraft should, if possible, be blown up in the air, or, if that is not possible, that the troops within it should be casualties before they can get out.

The other factor is that air-power must be met by air-power. It is fatal for this purpose to disperse the air forces at one's command. There cannot be the slightest doubt that the air forces of the Allies, split into several groups and four nationalities, could not have been as effective as they would have been with the same numbers functioning under the control of one central

THE CHANCES OF INVASION (Continued)

is not improbable that then, if ever, gas would be used by the Germans in the hope of paralysing the defenders. It is also quite within the bounds of probability that some or all of the first contingents of air-borne troops would wear British uniforms taken from the prisoners of war in German hands. That might help them in their first effort to gain local mastery, but afterwards it would be a danger to them as they might be shot by the Germans who arrived later. That risk might be accepted. Air-borne troops do not have a high regard for their own chances of survival.

If this first stage were successful, the stretches of beach were secured, and the troops and heavy arms were landed from the vessels without too heavy a loss, then the second stage would begin, namely, the subjugation of Great Britain. For an invasion across a sea to be successful, it has always been considered necessary that the invader should be in possession of an adequate port as an advanced base in the invaded country and should control the sea crossing between that and his main base on the Continent. In the hypothesis laid down above, the control of the sea by the Germans was not regarded as a possibility. Therefore, their chances of success would depend on either or both of two alternatives, (a) that in the original landing enough tanks, guns, and other necessaries had been got ashore to suffice for the campaign of conquest, and (b) that their bomber aircraft would be able to make good any deficiencies in that respect.

Now it is time to consider the various conditions which would militate against the success of such an attempt. We need not here expatiate further on the naval side of the matter, for we have allowed in imagination the chance of large numbers of vessels, barges and others, getting to the neighbourhood of the coasts of Britain, ready to land when the air-borne troops had secured the landing places. We have not allowed the possibility of reinforcements arriving from across the water, as the Royal Navy could easily checkmate any attempt to despatch them. A surprise on one day is conceivable, but a state of surprise lasting for several days is not.

The Defence

The second great difficulty in the way of bringing off an invasion on the lines described above is the extreme vulnerability of the machines which would carry the parachutists and the other air-borne troops. Presumably, escorts of fighters would be sent with them, but even disproportionately large escorts of fighters did not enable the German bombers to achieve their object in daylight last summer, and there is no reason why the verdict should be altered when the convoy was troop-carrying machines instead of bombers. It is possible that in the spring, if the attempt were postponed until then, the Germans might use new types of fighters which would be more formidable; but the British are not behindhand in this matter. A very high casualty rate among the troop-carriers may be regarded as a certainty.

However, if we suppose that a certain degree of success attended the landings, and that the German troops had developed their attack on the rear of the British troops on the beach, who may have been locally hampered by a gas attack, by that time it would be full daylight and the barges and other vessels would be approaching the beach. Then the R.A.F. bombers would have to show whether they could do what the German bombers failed to do at Dunkerque. The ships would present a splendid target, but doubtless German fighters would be more or less overhead to defend them from bombing attacks. We cannot believe that R.A.F. bombers would fail so completely as the German bombers failed off the French coast. During the Dunkerque episode the Germans had only just fought their way into France and were not established to the best tactical advantage in neighbouring aerodromes. The R.A.F. in defending its Home island has the advantage of being soundly established. Its stations are mostly known to the enemy, and would doubtless be attacked, but our experiences of last summer have taught us that enemy attacks on our aerodromes do not prevent the R.A.F. from carrying on its work. In the certainty of heavy British bombing attacks on the vessels as they made for land we see a major objection to the chances of success in getting the guns and tanks ashore.

One other possibility should be considered, namely, the conveyance of very light tanks or machine-gun-carriers in transport aircraft as part of the original landing. Experience in the goldfields of New Guinea has shown how three-engined Junkers machines have carried pieces of machinery weighing over three tons from the base on the shore over the mountain to the minehead. It was a gross overload, but that would not necessarily be an objection in time of war. The machines which have to do that sort of work need structural modifications to enable the floor to support concentrated weights, and it is not easy to imagine any large number of these fighting vehicles being landed in Britain in that way. If they were so landed, they would give considerable help to the troops in overcoming the local resistance of the Home Guard. But it must be remembered that the Army in Britain has already a by no means negligible force of tanks, and that its reserves are situated in tactical positions, chosen with care and skill. A very moderate force of British tanks would soon exterminate any number of German troops which had landed from aircraft, even if they had some machine-gun-carriers with them. The only chance for the latter would be to accomplish their purpose before British tanks could get at them.

Command of the Air Essential

But in the long run everything would depend on mastery of the air, on whether the German bombers and fighters could do what they wanted to do, or whether that would be true of the British fighters and bombers. Last summer the Germans acted on the theory that they must subdue the R.A.F. Fighter Command as a necessary preliminary to invasion, and they failed to subdue it. If the British fighters were neutralised, then the German bombers would have a free hand, while the German fighters could presumably keep the British bombers from interfering with the operations of the invading Army. The latter is a supposition, but not quite a certainty, for bombers with power-operated turrets can put up a good fight even against Messerschmitt 110s. But if the Fighter Command rules the air as it did last summer, the German attempts should have very little chance of success. That Command is certainly not weaker than it was last summer. Its numbers are greater, its excellent types of machines are about to be still further improved, and the training and spirit of its men are as good as ever they were. We may feel sober confidence that the R.A.F. fighters will not let the Army be overwhelmed by any sort of effort by the *Luftwaffe*.

CATALOGUES THAT AREN'T

THE name catalogue is usually associated with something which has a catch in it for the unwary reader, and a kind of mental armour is subconsciously assumed during perusal. There are, however, outstanding exceptions to this. A case in point occurs where the gentle art of philately, more commonly known as stamp collecting, is concerned: thick volumes, showing the values, used and unused, of every stamp of every nationality which has been issued since 1840, when Rowland Hill had his brain wave and the "Penny black" first saw the light of day.

An aeronautical offshoot of the hobby—or is it vice?—is the collection of airmail stamps and "flown" covers. A bound volume of twelve monthly issues of the Air Mail Magazine, published by A. Philips, Dock Street, Newport, Monmouth, is quite equal to any other stamp catalogue in the matter of interest, and, in addition to all the values and other ordinarily philatelic information, there are detailed descriptions of the airmail routes and the pilots who fly the machines. For those who are interested in this branch of the hobby it is excellent value at a half-a-crown post free.

LIMITS OF AIRCRAFT SPEEDS

Their Relationship to the Speed of Sound

By W. O. MANNING, F.R.Ae.S.

As several readers appear to have been puzzled by the statement in the article "Per Ardua ad Astra" in our January 16 issue that the maximum speed of an aircraft is dependent on the speed of sound, we have asked Mr. Manning to elucidate the subject for their benefit. Here is his reply.—Ed.

THE formula for the velocity of sound in gases is given in the appropriate text books as:—

$$V_s = \sqrt{\gamma p/\rho}$$

where V is the velocity, γ the ratio of the two specific heats, p the pressure and ρ the density. As pressure and density must vary in the same ratio it is clear that variations of density cancel out and can have no effect on the velocity of sound. If the temperature were to be altered, a variation of the pressure would occur without affecting the density, so that some variation of velocity with temperature would be expected.

As the volume of a given mass of a gas is inversely as density, the formula can be written as follows:—

$$V_s = \sqrt{\gamma p v}$$

where v is volume. In accordance with Boyles Law:—

$$pv = kT$$

where k is the gas constant and T is the absolute temperature. The formula can thus be written:—

$$V_s = \sqrt{\gamma k T}$$

from which it is clear that the velocity of sound in a gas varies as the square root of the absolute temperature and is unaffected by the density.

In all aerodynamical formulæ it is assumed that however the air may be disturbed by the movement in it of wings, fuselages, etc., its density is unaffected. This is not really the case, but the variations of density are so small that they have no appreciable effect on the validity of the formula concerned. But when the velocity reaches the speed of sound this is no longer so, and the ordinary formulæ do not apply. From tests it has been shown that pressure effects make their appearance at speeds of the order of 0·8 of the speed of sound in the case of many bodies, and that the result is always a large increase in the drag.

When an aeroplane wing is in motion in the air the speed of the air over the upper surface is somewhat greater than the speed of the air at a considerable distance from the wing. Increased local velocities of this sort also occur in the case of fuselages and other bodies. It follows that although the actual speed of the body may be below the speed of sound, yet this speed may be exceeded locally.

Whenever the air over a body or over a portion of a body moves at a speed in excess of that of sound, pressure waves are set up; these invariably cause a large increase of drag. In the case of bullets in flight these pressure waves have often been photographed. The angle at which the waves leave the nose of the bullet is $\tan^{-1} V_s/V$ where V_s is the speed of sound and V is the speed of the bullet. From this formula it is possible to calculate roughly the speed of the bullet in such photographs.

A Question of Energy

Pressure waves can be forced to move at a much higher speed than that of sound if sufficient energy is supplied to them. The small portion of the wave in front of the nose of the bullet is obviously travelling at the bullet velocity, which may be of the order of three times the speed of sound. But directly the wave leaves the nose it immediately straightens out, which shows that the wave loses its additional speed very rapidly when its energy supply fails. The blast effect of bombs is probably due to waves of this type, forced to travel at speeds greatly in excess of the normal. The gases emitted at the instant of explosion may have speeds of anything up to 10 times the speed of sound, and the pressure waves propelled by the mass of escaping gas at such high speeds will not reach their normal speeds until they are at a considerable distance from the explosion.

Although it is possible that there would be some difficulty in connection with controls, it would be possible for aeroplanes to fly at speeds in excess of that of sound but for the fact that the horse-power required would be prodigious, and much greater than there is any possibility of supplying by any known method. It is not uncommon for the muzzle velocities of projectiles to be as high as three times the speed of sound, but in this case the energy is supplied externally and is dependent on the properties of available propellants, and on certain limitations in the design of guns.

"Souvenirs" of Enemy Airmen

THE Air Ministry points out that instances have occurred in which enemy airmen who have landed in this country have given to civilians as "souvenirs" a flying helmet or other part of their equipment.

Articles such as enemy goggles, field boots, diaries, etc., which may seem to be of trivial importance, may yet afford information to the Military Authorities

Defence Regulation 79 has accordingly now been amended in such a way as to make it an offence for any person to retain any article, however it may have come into his possession, which he has reasonable cause to believe either dropped from any aircraft or formed part of any aircraft or the equipment of any aircraft or belonged to or formed part of the arms, clothing or equipment of any member of the armed forces of the enemy.

It is the duty of every person finding or receiving such an article to hand it over to the Naval, Military or Air Force Authorities or to the Police or to inform them where it can be found.

Any article not required by the Authorities may be returned to the finder.

It is not an offence in this country, as it is in enemy and enemy-occupied territory, to pick up and read a pamphlet dropped from enemy aircraft. Any person finding such a pamphlet should, however, notify the Authorities and, if required, should hand it over to them.

Plastics in U.S.A.

THE U.S. Naval Aircraft Factory has been requested to investigate the use of various plastic materials in aircraft construction. Tests will be made on wing panels and other structures of wood bonded with synthetic resinoids in order to compare them with metal components. And over in California the students of Aero Industries Technical Institute have built a low-wing monoplane trainer of Plexweve construction, known as the Model CT-6A. The construction of the wings, fuselage and tail surfaces consists of "wrapped strips of spruce around laminated bulkheads." Then a covering of fabric is applied to the outside. This two-seat open-cockpit machine with fixed undercarriage has clean lines, and with its Continental A-75 engine, developing 75 h.p., has a maximum speed of 133 m.p.h. at sea level and a rate of climb of 800ft./min. The aerofoil section is NACA 2415 at the root, varying to NACA 2409 at the tip.

New Gasket Material

THE ENGINEER reports that a new gasket material has been developed in Germany to take the place of asbestos. This consists of three layers of synthetic buna rubber and two layers of steel wire gauze, placed with the wires of each at 45 deg. to each other. All the layers are vulcanised into one and the material is resistant to water and oil up to 350 deg. C. and to glycol and leaded petrol. It is reported that the new gasket serves its purpose better than previous materials.

PETROL INJECTION IN MINIATURE

A Continental Conversion

SINCE the Germans went over completely to petrol injection in the engines of their operational military aircraft, much thought has been directed towards this method, and its freedom from icing has been held to be a very great advantage over the carburettor. The Continental Series A is a small four-cylinder horizontally opposed air-cooled engine which has adopted petrol injection, and, by courtesy of *The Intava World*, some particulars are given of it hereunder.

Several changes have been made in the 50 h.p. model to increase its output to 80 h.p. The compression ratio has been raised from 5.4 to 7.5 (increasing the b.m.e.p. from 122 to 137 lb./sq. in.) and the r.p.m. raised from 1,900 to 2,700. The 50 h.p. model had fuel of 65 octane specified, but the higher-output engine calls for 80 octane. The bronze valve seats and austenitic steel valves have been replaced by austenitic seats and stellite-faced valves.

It also has been necessary to modify the design of pistons and rings. "Waffle-iron" finning on the under side of the piston crown increases cooling, and an auxiliary oil throw-off from the connecting-rods improves resistance to ring-sticking.

Plunger Motion

Very satisfactory performance is obtained from hydraulic tappets, and they will probably be adopted more extensively in the future. While magneto ignition is standard equipment, battery ignition may offer advantages when electric starters are used more generally.

The fuel-injection unit was developed in co-operation with the Fuel Injection Corporation, of Muskegon, Mich. Fuel injection prevents ice formation in the induction system without requiring installation of an air heater or manifold jacket. Further, it is claimed that power at height is greater and that there is greater assurance of uniform mixture distribution under all operating conditions.

The device has two constant-stroke plungers having combined reciprocating and turning motion. The latter motion permits each plunger to serve two cylinders. Injection is into the intake manifold directly ahead of the cylinder. A check valve on the nozzle regulates the discharge pressure and also prevents evacuation of the fuel lines at part throttle owing to intake manifold depression.

Engine oil directed through small passages to each plunger serves not only to lubricate the parts, but also seals the plungers against fuel leakage. Any fuel which leaks past the plunger during the delivery stroke is conducted to the intake manifold through an annulus and tube. The latter also acts as a return for any excess oil that is trapped in the annulus. Only a very small quantity of fuel and oil is said to leak past the plungers.

Fuel Control by Restriction

Control of fuel delivered at part throttle is accomplished by restricting the inlet to the pump plungers with a valve that is actuated by the air throttle through a simple linkage. Under part-throttle operating conditions, less than a full-plunger displacement of fuel is required for the proper mixture, and restricting the plunger inlet reduces the quantity of fuel to a percentage of the full-stroke volume, depending on the degree of restriction.

Throttling of fuel and air is accomplished by a similar action, except that part of the fuel is in the gaseous state after it passes the throttle restriction. Although it might be expected that non-uniformity in fuel distillation range or vapour pressure would produce changes in flow for a given throttle position, experience is reported to have shown that, within the range of fuels used in aircraft engines, the variation from this cause is negligible.

Automatic compensation of mixture-strength at height is provided by selection of restriction conditions at the fuel throttle. Flow through the restriction of the fuel throttle depends on the pressure differential, as in any fluid system. There is, however, a reduction in this differential at height because the injector pump does not have the ability to produce the necessary lower absolute pressure on the low-pressure side of the fuel throttle. Compensation at full throttle, as well as at part throttle, is obtained by providing restriction at full throttle and suitably increasing the pump displacement to compensate for this restriction in order to obtain the required full-throttle flow.

Future Developments

The injector pump is installed at the front of the engine, partly because of the ease of cooling. Additional cooling is obtained by leading the engine air past the injector through a sheet-metal duct, thus helping to prevent formation of vapour ahead of the fuel throttle. A primer is necessary for good starting, because at cranking speeds the injector does not build up sufficient pressure to open the check valve in the nozzle. Spray from the nozzles is exceptionally fine and evenly dispersed due to a whirling action which is imparted to the fuel just before it is discharged by means of offset passages tangential to the final discharge hole. Injection pressure is about 75 lb./sq. in.

Some engineers suggest that the use of safety fuels will dictate the adoption of fuel injection, because fuel can be atomised more readily with this system than by conventional carburation. Cost will not permit, at least for some time, the wholesale replacement of carburation systems by fuel injection. It has been pointed out, however, that a resulting increase of approximately 10 per cent. in engine selling price would be offset by an accompanying reduction in installation cost owing to the elimination of the intake-air-heater system. Newer refinements in fuel injection may bring appreciable increase in power rating and reduced fuel consumption.

Die-cast cylinder heads are held to be a definite possibility for future development. It is quite likely that during the next few years engines with reduced weight-power ratios will be offered, and that the reduction in this ratio will be due to an increase in b.m.e.p. Continental will probably continue to build its direct-drive engines in the present rated speed range of 2,300 to 2,700 r.p.m., as the prospects for obtaining satisfactory airscrew efficiencies at higher speeds without reduction gearing are exceedingly poor.

Scottish Airways Time-table

THERE is a slight alteration to the time-table of Scottish Airways, and Services 4 and 5 have been combined to cover the route Glasgow-Tiree-Benbecula-North Uist-Stornoway, which is now operated on Mondays, Wednesdays, Fridays and Saturdays in each direction. The northbound service leaves from Grosvenor Restaurant at 8.45 a.m. and Renfrew Airport at 9.40 a.m., arriving at Stornoway Airport at 12.55 p.m. and the Maritime Buildings at 1.10 p.m. The return journey starts at 1.25 p.m. from the Maritime Buildings and arrives at the Grosvenor Restaurant at 5.35 p.m. A call can be made at Barra on request if 12 hours' notice is given and tide and weather permit.

Retreat of Nature

IT is reported that three new American factories, at Grumman, North American and General Motors (for Allison engine production), will be built without windows. Artificial lighting and air conditioning will be provided constantly so that temperature and humidity will not vary. This will add much to the comfort of workers and will have its effect by increasing the output, but it seems that all such advances must be paid for by getting farther and farther away from the natural things of life. If U.S.A. ever has to black-out it will make things much easier as well as saving a lot of money, and will eliminate entirely the danger from shattered glass.

Although the wings of the Ryan ST-3 are untapered and wire bracing has been retained, it has an attractive appearance and follows a predecessor which had very nice aerobatic qualities.

TWO AMERICAN TRAINERS

The Ryan ST-3 and Howard DGA-125 Make Their Appearance

THE new Ryan low-wing open cockpit trainer for 1941, known as the ST-3, has the familiar Ryan appearance but is an entirely new aeroplane, designed and built to take advantage of production experience. The new Ryan ST-3 is the commercial trainer version of the trainers being produced for the U.S. Army Corps. One of the ST-3 models is powered with the radial Kinner B-54 five-cylinder air-cooled engine; another has the in-line Menasco.

Many other important changes have been incorporated. The fuselage is wider by 3in. and longer by 14in., assuring roomy cockpits for student and instructor. The entire treadle-type landing gear has been changed and allows for several wheel and brake combinations. Tread has been increased by more than a foot to 78¾in., and the wheels are now set farther forward. The familiar Ryan streamlined wire-braced wings are used, but they are now swept back. The ST-3 fuselage is of semi-monocoque stressed-skin all-metal construction.

Competition Winner

Ryan now holds orders for $7,425,000 from the Air Corps for trainers to be built for Army and Navy pilot training. Confident in the belief that the ideal primary trainer should be a low-wing monoplane, the Ryan Aeronautical Company, in 1934, produced the first Ryan ST. Since then Ryan has been the pioneer in the low-wing trainer field, retaining the basic ST design, but constantly making numerous refinements.

It was a Ryan which last year was the winner of an Air Corps competition for primary trainers. Then the Ryan ST became the Army's first low-wing primary trainer, thus breaking away from a 30-year precedent of biplanes for initial instruction.

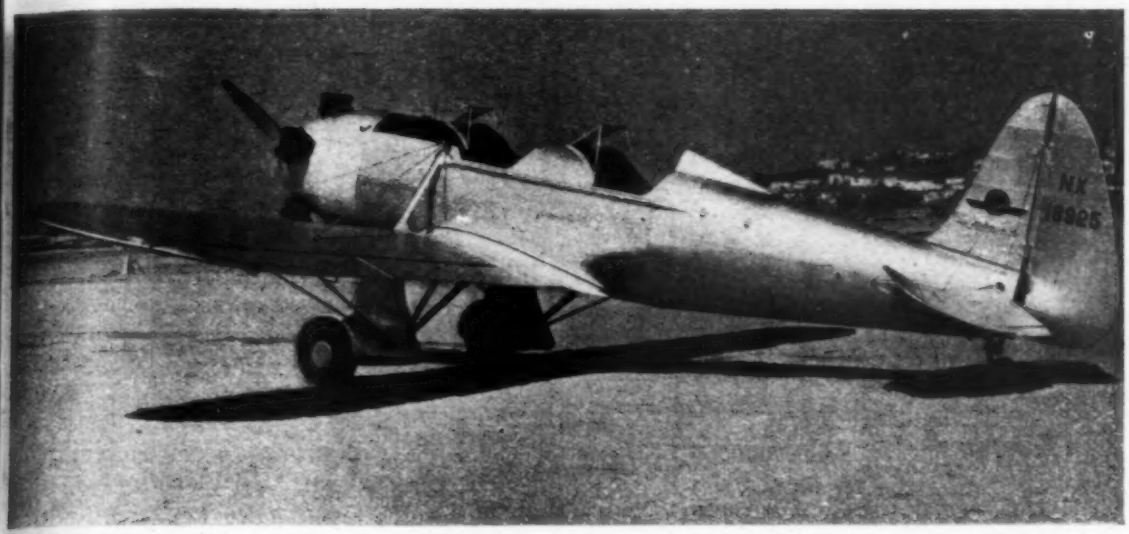
As far as possible, machined castings and forgings and built-up light alloy structures have replaced welded steel tubular units. The stub wings are of riveted aluminium alloy construction, while the outer wing panels incorporate spruce spars and ribs stamped from Alclad sheet. The stub wings are metal-covered, while the outer panels and the ailerons, flaps and tail surfaces are covered with fabric which is attached by sheet-metal screws instead of orthodox rib stitching. The entire leading edge of the wing is covered with Alclad sheet. The flaps are operated by direct-action lever from the left side of the cockpit. The maximum lowered angle is 30 deg., but the flaps can be locked in any intermediate position. Hinges of the flaps and all control surfaces are fitted with ball bearings.

The Alclad skin of the fuselage has the robust thickness of 0.032in., and none of the panels require any forming, so making them simple to replace. Brakes may be either mechanical or hydraulic, and the tail wheel is steerable. Elevator tabs are provided for trimming and are operated by hand wheel. Dual control, with dual brakes, are standard. Four engine installations are available, the Kinner B-54 (125 h.p. at 1,925 r.p.m.), the Kinner R-54 (160 h.p. at 1,850 r.p.m.), the Menasco D-4 (125 h.p.), and Menasco C4-S (150 h.p.), the two latter being four-cylinder in-line air-cooled engines.

Weights and Performance

Weights of the ST-3 with the Kinner B-54 engine installed are as follows: Weight empty, 1,228lb.; oil, 23lb.; petrol (24 U.S. gals.), 144lb.; instructor, 190lb.; student, 190lb.; other load, 547lb.; total loaded weight, 1,775lb. The power loading is 14.2lb./h.p., and wing loading 13.2lb./sq. ft.

The span is 30ft. 1in. and length 22ft. 5in. Height is 7ft. 2in. Various surface areas in square feet are: wing, 134; tail plane, 14.5; elevator, 11; fin, 4.6; rudder, 7.8; aileron, 11.1; and flap, 12.5. Other interesting quantities are: Wing dihedral, 4½ deg.; sweepback, 4 deg. 10 min.; airscrew diameter, 7ft. 6in.; airscrew clearance with thrust



The Ryan ST-2 was powered with an in-line engine, but the ST-3 is shown here with the Kinner B-54 five-cylinder radial. A four-cylinder Menasco in-line is, however, optional.

line level, 9in.; ground angle, 11¾ deg.; type of flaps, plain; wing aerofoil section, NACA 2412.

The makers' performance figures, subject to limits of plus or minus 5 per cent., are set out hereunder:

	Kinner B-54 125 h.p.	Menasco C4-S 150 h.p.
Maximum speed at sea level ..	120 m.p.h.	136 m.p.h.
Cruising speed	108 ,,	122 ,,
Rate of climb at full power and full load at sea level	635 ft./min.	830 ft./min.
Time to climb to 6,562ft. (2,000 m.)	13.5 min.	8.8 min.
Service ceiling, full load ..	12,900ft.	18,000ft.
Take off run, 5 m.p.h. wind, sea level	610ft.	520ft.
Landing speed, sea level ..	57 m.p.h.	57 m.p.h.
Endurance at operating speed ..	2.86 hr.	2.4 hr.

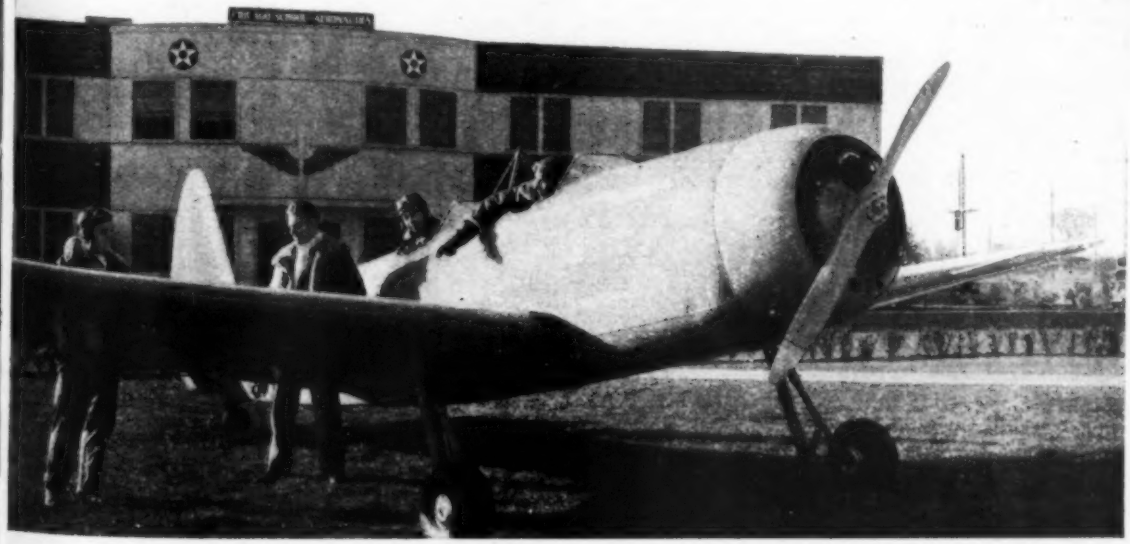
The Howard DGA-125

Another American trainer of low-wing monoplane design, of slightly larger dimensions and loaded weight than the Ryan, is the Howard DGA-125. This has been designed especially as a primary trainer for secondary and instructor courses of the Civilian Pilot Training Programme. Although "stressed" for higher-powered engines and military aerobatics, the Howard will generally be supplied with the 125-h.p. Warner Scarab, Series 50, a 7-cylindered air-cooled radial.

The engine accessory compartment and the cockpit are metal covered but the fuselage aft of the cockpit is of chrome molybdenum steel tubing with fabric covering. Wings and other aerodynamic surfaces are reported as of "plastic" construction; this presumably means that they are covered with plywood bonded with a synthetic resinoid adhesive and perhaps pre-moulded to shape.

Weights are: empty, 1,350 lb.; disposable, 607 lb.; total loaded weight, 1,957 lb. (but the aeroplane has been designed for a weight of 2,000 lb.). Power loading is 15.7 lb./h.p., and wing loading 11.0 lb./sq. ft.

The span is 34ft., length 26ft. 6in., and height 7ft. 3in. Landing gear tread is 113½in. and the brakes are hydraulic. The surface areas are: wing, 179.5 sq. ft.; ailerons, 20.2;



The Howard DGA-125 is another two-seat open cockpit trainer of neat appearance. It is intended for secondary and instructor courses in the U.S. Civilian Pilot Training Programme.

TWO AMERICAN TRAINERS (Continued)

tailplane, 10.7; elevator, 11.9; rudder, 6.7; and fin, 9.2 sq. ft.

The performance figures, which are corrected to standard atmospheric conditions and guaranteed by the maker to within 3 per cent., are as follows:—

Maximum speed	118 m.p.h.
Cruising speed at 75 per cent. power	108 m.p.h.
Landing speed	50 m.p.h.
Cruising range	365 miles.
Endurance at 75 per cent. power	3½ hrs.
Climb in first minute after take-off	800ft.
Climb to 5,000ft.	9½ min.
Take-off run	650ft.
Service ceiling	13,500ft.

As in the Ryan, the tail wheel is steerable and a trimming tab is provided on the elevator. This aeroplane is the product of a firm which has had considerable experience in the design of low-wing monoplanes and *Mister Mulligan* is a name which has not been forgotten as a racer of recent years in U.S.A. Both aeroplanes, as modern interpretations of the low-wing formula, should make good trainers.

MODERN TECHNICAL DEVELOPMENTS

Rotating the Landing Wheels : Upper Air Conditions : Recovery from Spinning

(Abstracts prepared by and made available by courtesy of R.T.P. of the Ministry of Aircraft Production)

THE use of runways of concrete or with surface aggregates such as asphaltic concrete or macadam has resulted in a considerable reduction in the life of aircraft tyres. Higher landing speeds, heavy tyre loads and lower tyre pressures further contribute to the decrease in life. The additional tyre wear on hard, abrasive surfaces results mainly from the following factors: acceleration upon landing, deformation of the tyres in close taxi-ing turns, slip due to the use of brakes, and lateral tread scrubbing due to misalignment and lateral motion. The inertia of the wheels, which at the moment of ground contact are stationary and which are brought up to the rotating speed corresponding to the taxi-ing speed solely by ground friction, can add greatly to tyre wear in large aircraft. This type of wear is claimed to have been eliminated by a device for which Vickers-Armstrongs, Ltd., have been granted British Patent No. 516,738. The plan is to spin the wheels by means of wind cups on the wheels themselves or on the tyres.

Tyre Wear on Runways (Inter Avia, No. 731, 12.10.40, p. 11).

* * *

AN improved type of radio sonde was taken into operation by the meteorological service of the Italian Air Force in the latter part of 1940. The new sondes report by radio the temperature, static pressure and humidity met with in the upper atmosphere. Known as the "Italia," this type is used by the "Centrale Assistenza Volo dell' Aeroporto Littorio-Roma," and weigh, including the transmitter, batteries, aerial, 1.44 lb. The average rate of climb is 11ft./sec., and the ceiling is about 98,000ft. The temperature-measuring range extends over as much as 70 deg. C. All values measured are transmitted automatically to the ground station every 30 seconds and the range of the transmitter varies from 62 to 125 miles. Upon reception of each signal the ground station checks the position of the sounding balloon, so enabling a determination of wind speed and direction at altitude to be made.

Improved Type of Radio Sonde (Inter Avia, No. 728, 19.9.40, p. 4).

* * *

AS part of a general investigation by the N.A.C.A. of factors that affect the spin, the use of the aileron as an aid to recovery from the spin has been studied. Tests of 10 different models, covering a wide range of mass distribution, were made in the N.A.C.A. free-spinning tunnel to determine the effects of a large downward deflection of the outboard aileron and of normal angular deflections of the ailerons upon recovery characteristics.

The results indicate that the direction of aileron setting, with or against the spin, which will aid recovery from the spin, depends upon the aeroplane weight distribution. For monoplanes and for biplanes with lower-wing ailerons, ailerons *with* the spin will be favourable when the weight is distributed chiefly along the fuselage (single-engine aeroplanes) and ailerons *against* the spin will be favourable when the weight is distributed chiefly along the wings (multi-engine aeroplanes). Downward movement of the outboard aileron through a large angle will not always be effective in aiding recovery, the effectiveness of such a movement also being dependent upon the weight distribution of the aeroplane.

The Aileron as an Aid to Recovery from the Spin (A. I. Neihouse, N.A.C.A. Tech. Note, No. 776, Sept. 1940).

GOOD RESPONSE TO A.T.C. SCHEME

MORE than 4 000 offers of help in the organising and operating of the newly inaugurated Air Training Corps for boys between the ages of 16 and 18 years of age, have been received at the Air Ministry by Air Commodore J. A. Chamier who, at a recent meeting, stressed the fact that such volunteers should get into touch with their local authority direct.

"The response to the whole scheme has been startling," he said. "We first of all sent out 500 circular letters to the mayors and chairmen of councils of places with more than 20,000 population which had no cadet corps and received immediate replies from 75 per cent. of them. More letters were then sent to places of similar size where cadet corps already existed. Altogether 99 per cent. of the replies were favourable; 61 per cent. reported the formation of committees, 21 per cent. said they were furthering present squadrons and 17 per cent. expressed their willingness to help and promised to get committees going at once. The remaining one per cent. were a little diffident about their ability to take active part but, on the other hand, we received enquiries from smaller places, where no cadet corps previously existed, asking for information. In spite of this startling response," said Air Commodore Chamier, "we have managed to keep pace with it and every letter has been answered within 24 hours."

The flood of offers to help, however—they come from ex-officers and others willing to undertake local organisation and training—has somewhat overwhelmed the Air Commodore's available staff and it is pointed out that as service in the A.T.C. is local, voluntary and part-time, civic authorities have agreed to take over the responsibility of local squadrons in their own areas, and such offers of help, therefore, should be made direct to them. Already 230 squadrons have sent in their registration. Of these, 200 were originally Air Defence Cadet Corps. In addition, at least 20 new squadrons are known to be in process of formation in Greater London alone; Coventry, Bristol and Southampton have squadrons in spite of the blitz and evacuation, while even such places as Southend, Eastbourne, Hastings and other coastal towns which are seriously depopulated have said they think they can find the boys to form squadrons.

Mr. J. F. Wolfenden, Director of Pre-entry Training, said that Air Ministry officers had visited every university not on the original list and all had signified their willingness to participate. So far, 187 universities and schools had made definite applications, and nearly 700 suggestions for the motto and crest had been received. Small school units would have to be merged into larger units for administration.

Correspondence

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

ORIGIN OF THE Me110

Designed from Stolen French Plans

IN a technical description of the German Messerschmitt Me110, which was published in your number of the 10th October, 1940, the author is full of praise on the designing of the fuselage of this machine. He even seems surprised "that the nation which brought Fascism to its full ugliness can produce a flying machine which is very pleasing, in fact beautiful, to the eye" (page 308).

We feel that the author, and your readers, will admire the fuselage of the 110 more readily when they learn that it is merely an exact copy of the fuselage of the French plane, Potez 63, and that it was constructed from plans of this plane stolen in France by the Germans.

The only differences are the utilisation of 1,150 h.p. water-cooled engines instead of 700 h.p. air-cooled ones and the fitting of a more powerful armament in the fuselage instead of placing it in the wings. COLONEL P. FONTAINE.

GLIDING FOR A.T.C. CADETS?

Means of Flying Instruction at Low Cost

I WAS most interested in the article in your latest issue about the newly-formed A.T.C. One possibility, however, was not touched on—the possibility of giving gliding instruction to the cadets. It seems that like the University Air Squadrons, through some extraordinary short-sightedness many gliding clubs were allowed to fall into disuse on the outbreak of war. My home since the war has been near Swindon on the edge of the White Horse Hills which, I believe, are ideal gliding country. I saw someone gliding above Bishopstone during the first month of war, but I have never seen a glider since then. What has happened to the gliders? If their former flyers have been called to the Colours, surely they could be dug out of the sheds, where they are presumably mouldering, for use by the A.T.C. cadets who could then receive the best training possible in flying at very little cost and without using petrol. I sincerely hope this aspect of the training will be seriously considered. NIGEL SEYMER.

ASSISTED TAKE-OFF

Why Not a Retractable Wing?

IN regard to the problem of assisted take-off recently under consideration in your journal, it seems rather curious to me that no one has suggested the retractable wing as a possible solution of the problem. The device is not new. You will surely have a record of the experimental aircraft constructed in the United States about eighteen months ago which incorporated it. The results obtained from this elementary application of the principle amply justified the departure from orthodox methods employed to increase lift. The engine used was of 180 h.p. Retracted the span of the wings was 24 feet, extended to 32 feet. The undercarriage was also retractile. With a fixed-pitch propeller, speed with wings extended was 130 miles per hour. When the wings were retracted this was increased to 185 m.p.h. The gain, upon raising the undercarriage, was about 15 m.p.h., thus bringing the maximum speed (at sea level) to the region of 200 m.p.h., a creditable performance on 180 h.p. With the wings extended, take-off run was remarkably short and climbing qualities excellent. When retraction was effected, by means of a simple hydraulic gear, operated from the cockpit, the speed increase was, as can be seen from my figures, considerable.

I see no reason why the principle could not be applied to the modern fighting aircraft or bomber. The advantages of increased lift and subsequent increase in speed are obvious. The disadvantages do not seem to present insoluble problems. As I see it they are as follow: When applied to fighter aircraft the most obvious is the increase in weight necessitated by the retraction gear, hydraulic or electric. (I would suggest the latter as preferable.) Secondly, the mounting of wing guns, with their attendant advantages, would seem to be impaired, though doubtless a compromise could be reached whereby the amount of retraction could be arranged to allow for the wing weapons. In the case of the bomber the only real consideration, apart from the weight factor, seems to be the mounting of the engines. These would obviously have to be inboard of the retractile outer wing panels, on the fixed centre section into which these would withdraw. It is not for me to indicate the solutions of these problems, but I think the whole matter might be worthy of consideration in the light of the present difficulties which our designers are encountering in their attempts to combine both high lift, short take-off run, and high ultimate speed. Perhaps even greater advantages might be gained by the incorporation of laps and slots in the system.

R. H. MANLEY.

SPEED OR ARMAMENT

Rapid Production a Factor

MR. T. R. U. CROKER'S analogy concerning the alternatives of speed, armament, or armour (*Flight*, December 26) proves to be unsound on examination. First, a bomber is an attacking weapon (it destroys the "beast of prey" "at source"), whereas his animals are all defensive. Mr. Croker prefers armour to speed because we must sacrifice load to get the latter. But surely effective armour requires the same sacrifice if we are to keep our bombers down to a rational size. His "tortoise-'plane," with its disposable load equal to that of present machines and the generous slabs of armouring, he says, need cruise little faster than its take-off speed. If it cruises at only 100 m.p.h. it is bad enough, and assisted take-off is still urgently required. We can't get away from the "slip-wing."

This 100 m.p.h. bomber will produce a corresponding 200 m.p.h. fighter—without armour—but with a real life-size "cannon" that will wipe it up at leisure. But the "P-B." bomber *cannot* be equalled by the enemy's fighter.

In one respect Mr. Croker's analogy holds good. Rabbits do rely partially on speed for survival, but also very largely on "production." I do not think this applies to tortoises or porcupines. I believe that the "P.-B." bomber—*sans* gunner, *sans* guns, *sans* turret, etc—would lend itself to more rapid production than the present "porcupine" bomber or Mr. Croker's projected "tortoise" type. A. CONWAY.

TIED BY RED-TAPE

Young Volunteers Debarred from Joining Up

WRITING for single young men, who, like myself, are very desirous of joining the Services, but whose natural enthusiasm is continually thwarted by red-tape methods insisted on by the Ministry of Labour and carried out by employers without discretion. Many young men, including myself, employed in aircraft drawing offices, and engaged mostly on routine work of a semi-technical character, registered, upon their employers' instructions, as draughtsmen. Now, wishing to join the Services, these men are refused a letter of release, although these fellows have lost all interest in the work they are doing, feeling that such work could very well be done by much older or medically unfit men. The training of such men does not present much difficulty, and could surely be arranged so as to release one or two young men per month from each office.

We are told that one volunteer is worth ten "pressed men"; thus, every time the above release is refused the country is, in effect, losing the services of ten conscripts. Surely it is much better for the country, and for the individual, for a man to be employed in a task in which he can give vent to his enthusiasm instead of his being forced to continue a monotonous task which could be equally well performed by the medically unfit or the older man? In conclusion, it must be stated that if an erstwhile recruit possesses a letter of release from his employers the Ministry of Labour raise no objection to his joining up. Would it not be possible for the Ministry of Labour to review the case of a man whose employers refuse him this permission, with a view to finding a replacement (of which there must be many in the country) for whom but little training would be required? "DISGRUNTLED."

Yeovil.

HERE AND THERE

FREE BELGIUM PAYS FOR SOME AIRCRAFT. M. Gutt, the Belgian Finance Minister, presents a cheque for £100,000 to Lord Beaverbrook, Minister of Aircraft Production, at the Belgian Embassy. On the right is the Belgian Ambassador.

Expansion of S. African Air Force

IT was announced officially in Pretoria recently that the South African Air Force is to undergo considerable expansion. Several thousand pilots are required, and the conditions of service of air pupils have been broadened, which should result in immediate requirements being very quickly recruited.

Airline Deliveries in America

IN the first ten months of 1940, 87 new transport craft were delivered to twelve of the U.S. airlines. Douglas DC-3s headed the list with 63, and there were 9 DSTs, a variation of the DC-3. There were also ten Lockheed Lodestars and five Boeing 307-Bs, the well-known Stratoliners.

Co-operation

AIR CHIEF MARSHAL SIR CHARLES BURNETT, Chief of the Australian Air Staff, arrived at Singapore towards the end of January. There he discussed matters of mutual interest with the C.-in-C. of the Far East, Air Chief Marshal Sir Robert Brooke-Popham. During his stay Sir Charles Burnett is visiting units of the Royal Australian Air Force at present stationed at Singapore.

The Empire Scheme

THE Canadian Deputy Minister for Air announced recently that the Empire Air Training Scheme is now so far ahead of schedule that at the end of December there were 25 per cent. more men on the staff, trained, or in training, twice the number of air crews under instruction, and twice the number of pilots actually graduated than was contemplated under the original plan. The scheme, he said, was now in a position to send overseas tens of thousands of airmen this year and next. Owing to the rapid construction of aerodromes and other establishments, the scheme had been able to accommodate the R.A.F. schools as soon as Britain was ready to transfer them.

Mr. Duncan added that unless it was decided to enlarge the scheme, it would reach by September, 1941, the full development which was originally fixed for the spring of 1942. Mr. Duncan has been obliged to return to private life, having now taken up the presidency of the Massey Harris company. Mr. Mackenzie King has issued a statement in which he pays high tribute to Mr. Duncan's services as one of the chief organisers of the Commonwealth Air Training Scheme.

Instrument Panel Lighting

TO reduce glare and eye-strain when looking at the instrument panel, a system of lighting has been devised for the U.S. Army Air Corps which operates by means of fluorescent paint on the figures of the dials. Light which is invisible to the eye and so does not dazzle, activates the paint and causes it to fluoresce with a soft glow which is easy to look at.

Lear Gyromatic Navigator

A NEW "integrating" type of navigating instrument is announced by Lear Avia in U.S.A. which combines the indications of an automatic radio direction finder with those of a directional gyro and so simplifies the pilot's navigational work. The indications of the instrument are available for straight flight towards or away from a radio station, straight flight under unknown and varying drift conditions, instrument approach and landing using a single non-directional marker beacon on the prolongation of the runway, as well as all the indications of a radio direction finder and a directional gyro.

For South American Clubs?

AN item of news in the *Mundo Aeronautico*, a South American journal which recently reached this country, reminds us that there are parts of the world where club life and private flying still flourish! This refers to a new light cabin monoplane, the Boyero, now being made by the Fabrica Militar de Aviones at Cordoba, Argentina. This is a high-wing, side-by-side two-seater, fitted with dual control, which has a 50 h.p. engine, but is stressed to accommodate a 65 h.p. unit as an alternative. Prototype trials are reported to be proceeding, and the following data is given for the 50 h.p. model: Maximum speed, 93 m.p.h.; landing speed, 37 m.p.h.; gross weight, 1,257 lb.; service ceiling, 11,950ft.; range, 300 miles. The important matter of purchase price is not mentioned.

U.S.A. Trains Parachute Troops

THE first U.S. Army parachute battalion has been formed and is in training. Each company of 117 men, each armed with pistols, will have in addition 87 automatic rifles, ten submachine-guns, nine light machine-guns, and three 60 mm. mortars. For transport, nine folding bicycles will be carried. Parachutists are eligible for extra pay under a recent War Office ruling.

North-American Bomber

A NEW American bomber design has made its appearance in the North American B.25. This is a twin-engine midwing monoplane with twin fins and rudders arranged at the ends of the tailplane, the only outward respect in which it can be distinguished from what seems now to be the American "bomber formula," namely, midwing or high midwing, transparent nose, undercarriage retracting into engine nacelles, and retractable nosewheel. Very few American designs are appearing with other than tricycle undercarriages.

Helpful Gesture to Flying Clubs

WHEN war broke out and all civil flying stopped, flying clubs up and down the country who were participating in the Civil Air Guard scheme found themselves saddled with liabilities totalling some £51,000. The Air Ministry, though under no legal obligation to do so, has already made *ex gratia* payments amounting to some £70,000 in respect of interrupted training courses which would have earned grants, under the C.A.G. scheme, had they been completed. Now they have offered a further contribution of £15,000 as an *ex gratia* payment, towards the club's own liabilities inflicted on them by the outbreak of war.

Incidentally, the Air Ministry has requisitioned more than 250 of the 470 machines registered in the names of flying clubs, another 20 are now to be taken over by them for training purposes, and it is estimated that the total sum payable for these aircraft will be in the region of £100,000. In the year ending September, 1939, during which the Civil Air Guard scheme operated, £295,000 was paid out in subsidies.

Service Aviation

Royal Air Force and Fleet Air Arm News and Announcements

R.A.F. Dinner Club

NO dinners will be held by the Royal Air Force Dinner Club until the conclusion of hostilities. Members of the Club should, therefore, take early steps to cancel their annual subscriptions and bankers' orders until further notice. Any communications on the subject should be addressed to the Act. Hon. Sec., Wing Cdr. E. Bentley Beauman (Retd.), Air Ministry, King Charles Street, Whitehall, S.W.1.

Pigeon Service

SPECIALLY-TRAINED homing pigeons are being used by the Royal Air Force as an emergency means of communication. Through the National Pigeon Service many hundreds of birds have been bred for work with bombers and Coastal Command aircraft. Some of these birds have put up fast times with their messages, often flying in unfavourable weather conditions.

Some R.A.F. birds, flying singly from aircraft, have put up near-championship times. The fastest flight recorded so far in the present war was at a speed of 68.7 m.p.h. and another bird distinguished itself by covering 175 miles in a gale.

Higher and Higher

CONCURRENT with the quest for speed and yet more speed as a desirable feature of the military aeroplane comes the struggle for height. The new bombers and fighters, such as the Stirling, Spitfire III, the later marks of Hurricanes, the Tornado and Whirlwind, all have increased performance in both service ceiling and speed.

Increase in the high wing loadings now used, in order to obtain speed and carrying capacity with a given engine power, is likely to keep operating height at about the 40,000ft. mark. This limit is probable owing to the difficulties experienced in supercharging powerful engines at these heights. Take-off also becomes somewhat of a problem, and some form of assistance appears inevitable. The Germans are reported to be getting Junkers Ju 88s off for special missions at some 50lb. per square foot.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations :—

DISTINGUISHED FLYING CROSS.

Flight Lieutenant Samuel McCaughey Boal, No. 217 Squadron.

Flight Lieutenant Derek Price Marvin, No. 206 Squadron.

Act. Flight Lieutenant James Douglas Steuart-Richardson (since killed in action), No. 53 Squadron.

Flying Officer Alfred Lawrence Fowler, No. 248 Squadron.

DISTINGUISHED FLYING MEDAL.

Sergeant Stanley Henry Hawes, No. 240 Squadron.

Sergeant Howard Sidney Webb, No. 59 Squadron.

One of the above officers was on patrol over the North Sea when he fought a determined action against a Dornier 215, an aircraft of superior speed and fire power to his own. Although wounded in the hand, face and eyes he pressed home his attack until the enemy broke off the engagement. He then brought his damaged aircraft back to base. Another officer has taken part in 77 operational flights by day and 47 by night. One recipient, a wireless operator air gunner, has on two occasions, although wounded, successfully directed his pilot's evasive manœuvres when attacked by the enemy.

Middle East Awards

HIS MAJESTY THE KING has approved the following awards :—

DISTINGUISHED FLYING CROSS.

Flt. Lt. Graham Danson JONES and P/O. Reginald Alan COLLIS.

P/O. Collis volunteered to fly a single engined aircraft over difficult and mountainous country into rebel Abyssinia carrying a representative of the Emperor Haile Selassie to confer with rebel chieftains. The aircraft, which also carried an army officer and a Sgt. Observer, was further loaded with essential stores.

With this heavy burden the pilot was able to make a successful landing in extremely difficult country eight thousand feet above sea level. A conference, which was urgently desired by the General Officer Commanding British troops in the Sudan, took place. Since it was impossible for the aircraft to take off from the rough ground on which it had been landed P/O. Collis was obliged to remain in Abyssinia for two nights and supervised the preparation of a runway which enabled him to take off.

The flight was undertaken in spite of the fact that enemy fighters were known to be in the vicinity. In addition to having made long and arduous raids into enemy territory, this officer also made a two hundred mile flight into Abyssinia in an attempt to drop supplies for rebel forces. Later, he led a formation of three aircraft which succeeded in dropping ammunition, money and supplies for the rebels.

Flt. Lt. G. D. Jones has taken part in more than forty raids, many of them in very bad weather and against strong enemy opposition. In a raid on Valona early last month two flights were obliged by severe icing conditions to turn back and two of their aircraft were lost. The flight led by Flt. Lt. Jones continued on its mission. Over the target they encountered fierce opposition from enemy fighters which they engaged, shooting down one. Then they delivered the bombing attack with determination, and accurately placed all their bombs. Ten days later Flt. Lt. Jones carried out a successful low level attack on enemy ground forces during a blinding snow storm.

DISTINGUISHED FLYING MEDAL.

Sgt. MURRELL—an air gunner in a Rhodesian squadron. He took part in a dive bombing attack on a target in the Metemma area on January 4. His aircraft, which was leading the formation, was struck by splinters from an anti-aircraft shell. Sgt. Murrell was wounded in the knee but removed the shell splinter with a screwdriver. He then discovered that the aircrew covers had been set alight apparently by red hot shrapnel and had fallen on the floor of the rear cockpit where they were beginning to blaze. He threw them overboard, but finding he could not operate the extinguisher, he attacked the flames with his hands. The pilot signalled to him to abandon aircraft by parachute, but he continued to deal with the blaze until the pilot succeeded in making a forced landing. The fire was then extinguished with water and the aircraft flown safely back to its base.

THE King has been graciously pleased to approve of the following awards in recognition of gallantry and distinguished service with the Royal New Zealand Air Force :—

GEORGE MEDAL.

Cpl. E. A. STRATTON, R.N.Z.A.F.

L.A/C. (now P/O.) D. T. HERRICK, R.N.Z.A.F.

On the 21st June, 1940, an Oxford aircraft which was taking off from the Elementary Flying Training School, Taieri, New Zealand, crashed and caught fire. Two of the occupants were easily removed by the ambulance crew, who were under the impression that no one remained in the aircraft.

On ascertaining that the pilot was still in the burning aircraft, however, Cpl. Stratton and L.A/C. Herrick, without the protection of asbestos fire suits and with the full knowledge that there was a 250lb. bomb in the burning wreckage, removed the pilot from the cockpit in which he was jammed.

Fortunately the bomb did not explode, but both airmen sustained damage to their clothing and slight burns to themselves. Both airmen displayed outstanding bravery and a complete disregard for their own safety. Unfortunately the pilot died from his injuries.

Commendation

The King has also been graciously pleased to give orders for the publication of the name of the undermentioned airman in the *London Gazette* as having received an expression of Commendation for brave conduct in connection with Civil Defence :— A/C.2 Stephen James Read.

Prisoners of War

NEXT of kin, if able to identify the men from the information published, are requested to advise the Casualty Branches of the Services concerned, forwarding Regimental or any other details.

The following is the latest list of British prisoners of war as received from enemy sources :—

IN GERMAN HANDS.

Sgt. G. E. Bessel, Beach Avenue, Upminster, Essex.

Sgt. R. W. Cullen (?Curren), Ashcroft Gardens, Northampton.

Sgt. R. W. Jones, address unknown. Wounded. In hospital.

Flt. Lt. H. C. Marshall, c/o Miss M. Hewittson, Kent.

(?Tent), End House, Ashton Keynes, nr. Swindon, Wiltshire.

MODERN SIR GALAHAD. The Queen and Princesses Elizabeth and Margaret Rose were assisted from a Lockheed Hudson during their visit to a Coastal Command Station.

Roll of Honour

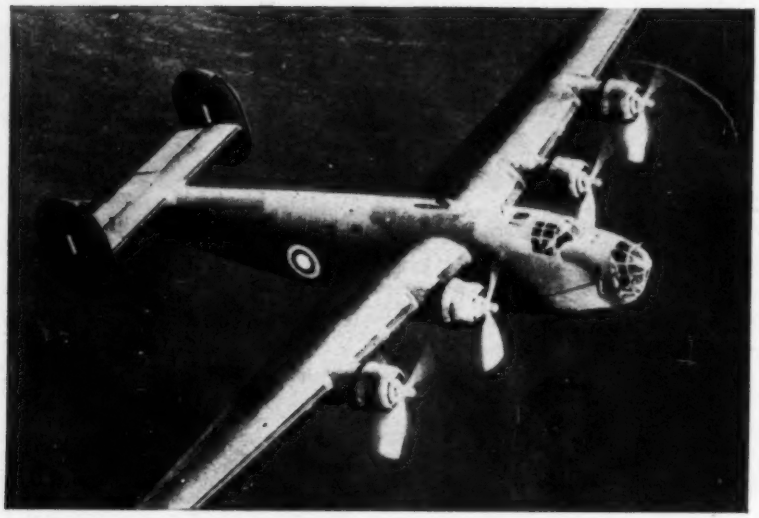
AIR MINISTRY CASUALTY COMMUNIQUE No. 58.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed.

KILLED IN ACTION (WHILE FLYING IN OPERATIONS AGAINST THE ENEMY).—Sgt. N. C. Ashley, 742042; Sgt. C. Blackshaw, 612284; Sgt. W. H. E. Boast, 749598; Sgt. R. J. Bowden, 748539; Sgt. A. R. Clarke, 744984; Sgt. J. L. Curry, 748639; F/O. L. S. Delaney, 40371; Sgt. R. B. Elliott, 581379; P/O. J. H. Erskine, 81034; Sgt. W. O. Evans, 530401; P/O. P. J. B. Griffiths, 41016; 943247; Sgt. W. C. Langdon, 751603; Sgt. T. A. McCord, 612781; P/O. B. P. McNamara, 42856; A/C.1 T. Middlebrook, 649212; F/O. G. S. Ogilvie, 72507; Sgt. J. Olive, 978156; Sgt. W. E. Pennell, 966641; Sgt. V. Pollard, 745972; P/O. A. R. Quemby, 42645; Sgt. M. R. Ritchie, 631868; P/O. S. C. Stone, 42540; Sgt. A. C. Taddhunter, 747976; Sgt. R. T. Thomas, 754426; Sgt. P. F. Wilcock, 647226; Sgt. T. N. Wilson, 754004.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. J. B. Callaghan, 565694; P/O. L. R. Dorrien-Smith, 72501; F/O. G. B. Morgan-Ilcan, 40131; L.A/C. D. McL. Nimmo, 536679; A/C.1 H. B. Sewell, 531362; A/C.1 D. W. Sharpe, 541437; L.A/C. L. Turner, 751657.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Act. Flt. Lt. C. F. G. Adye, 28173; Sgt. J. L. Alexander, 562397; P/O. L. J. Ashfield, 40198; Sgt. D. J. Avent, 566960; Cpl. E. T. Baillie, 507775; F/O. J. W. Baird, 39408; Sgt. D. H. J. Barrett, 580865; Sgt. F. E. Beames, 522176; P/O. B. S. Bell, 40663; F/O. F. D. Bird, 33300; Sgt. J. T. Bowen, 515101; Sqn. Ldr. R. L. Bradford, 33019; F/O. G. R. Branch, E.G.M., 90137; L.A/C. W. E. Brewster, 546678; Sgt. C. J. W. Brinn, 563306; Sgt. L. J. Brooks, 742109; Sgt. J. F. Brown, 565062; L.A/C. E. W. Burnett, 613517; Sgt. N. H. Burton, 580867; Sgt. C. H. Butler, 745989; Sgt. G. A. Cartwright, 580604; L.A/C. W. T. Cavanagh, 542287; F/O. G. L. Chambers, 90343; P/O. D. E. S. Charles, 74349; A/C.2 K. C. Chatfield, 630838; L.A/C. R. D. K. Cochrane, 903064; F/O. W. C. G. Cogman, 39274; A/C.2 G. D. Coles, 618330; Sgt. E. F. W. Curtis, 564067; F/O. J. Dawson, 90331; P/O. F. G. H. Dench, 42487; A/C.2 M. D. Dolan, 631053; P/O. W. M. Douglas, 43430; Sgt. W. Eddleston, 524172; F/O. J. D. Edmonds, 39371; P/O. D. G. Fevez, 42746; Flt. Lt. G. M. Fidler, 34219; Sqn. Ldr. A. L. Franks, A.F.C., 26053; A/C.2 A. Fryer, 626227; F/O. T. J. Geach, 33311; L.A/C. J. H. K. Gegg, 551672; F/O. J. C. Gilbert, 90327; L.A/C. D. Goffe, 551547; F/O. G. V. Gordon, 39080; Sgt. A. N. Gray, 581175; Sgt. P. C. Gray, 580511; P/O. W. A. Gray, 43166; Act. Sqn. Ldr. G. F. Hall, 37350; Sgt. J. C. Harrison, 519293; Sgt. E. Hibbert, 564863; Sgt. C. G. Hill, 550063; L.A/C. T. Hogarth, 543524; Sgt. R. G. Hopkins, 561177; Sgt. D. V. Hughes, 937392; F/O. J. Ing, 39987; Flt. Sgt. W. T. Jones, 580275; F/O. G. M. T. Kerr, 90336; P/O. T. Kerr, 70863; P/O. K. Kirkcaldie, 72526; Sgt. B. E. S. Knowles, 580790; Act. Sqn. Ldr. H. V. Lawrence, 37549; F/O. C. A. Lee-Steere, 90129; F/O. W. E. Lea-



TRANSATLANTIC HEAVYWEIGHT: A four-engined Consolidated B24 long range bomber in R.A.F. uniform. The de-icing equipment shows clearly on the leading edges of the main planes and tail surfaces.

gard, 34045; P/O. J. D. B. McKenzie, 40726; Act. Sgt. F. W. McKinlay, 581187; P/O. J. R. McLaren, 78975; P/O. A. McLeod, 42013; Sgt. G. Mackenzie 518372; Sgt. D. D. Mackinnon, 745928; L.A/C. C. A. Malcom, 523441; Act. Flt. Lt. A. D. J. Martin, 40127; P/O. J. G. Masters, 42249; Sgt. N. C. Middlemass, 580461; Sgt. V. C. Monkhouse, 580343; P/O. J. D. Morrison, 41096; L.A/C. R. J. Newberry, 549885; Cpl. B. F. Nowell, 565931; Act. Flt. Lt. D. W. H. Owen, 39332; Sqn. Ldr. G. V. Perry, 90263; Act. Sqn. Ldr. J. A. Pitcairn-Hill, D.S.O., D.F.C., 33201; A/C.1 J. Potter, 610963; Act. Cpl. F. Preston, 551160; Sgt. K. F. Quarrington, 580810; P/O. V. A. Rendell, 77040; F/O. D. P. W. R. Robinson, 39173; P/O. V. D. M. Roe, 42530; L.A/C. R. Roskrow, 536061; Sgt. W. G. Ross, 516232; P/O. H. Scott, 77368; Sgt. E. E. Scrase, 615919; A/C.2 W. A. Seymour, 629671; P/O. N. D. Solomon, 79731; P/O. J. W. B. Stevenson, 42158; P/O. G. McK. Stewart, 41625; Act. Flt. Lt. J. L. Sullivan, 37643; Sgt. H. R. Sunderland, 755141; Act. Sgt. C. Taylor, 530913; Act. Sqn. Ldr. E. H. T. Thwaites, 37134; L.A/C. C. S. Torrance, 759298; Sgt. E. Tucker, 581420; L.A/C. P. A. Tyler, 541348; L.A/C. R. H. Tyler, 552475; F/O. T. W. Walker, 71008; F/O. R. N. Wall, 37839; P/O. R. A. West, 41972; P/O. C. A. Weeks, 40494; A/C.2 M. Whelan, 630351; P/O. H. E. White, 40787; L.A/C. J. White, 627575; Act. Flt. Lt. E. H. Whitehouse, 42035; F/O. W. C. Wilkinson, 40058; Sgt. F. J. Willoughby, 565351; F/O. J. K. Wilson, 90339.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW REPORTED KILLED IN ACTION.—Sgt. W. C. Clarke, 562044.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW REPORTED KILLED IN ACTION.—P/O. E. W. Blackwell, 81386.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—P/O. P. T. Emmson, 42986; Sgt. B. W. Green, 748754; P/O. J. R. S. Oelofse, 42519; F/O. P. B. Pickersgill, 41057; P/O. N. A. Sadler, 82732; Sgt. H. Taylor, 745958; Sgt. W. H. Thompson, 550519; Sgt. J. G. D. Wilson, 755595.

WOUNDED OR INJURED IN ACTION.—P/O. J. G. Benson, 81365; P/O. R. F. T. Doe, D.F.C., 41908; Sgt. G. Furney, 816134; Sgt. K. G. Hughes, 755086; Sgt. A. K. Murrell, 776201; A/C.2 W. E. Neve, 1350608; Sgt. H. B. Pullen, 971268.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Lt. H. D. Ripley, 70575.

PREVIOUSLY REPORTED WOUNDED OR INJURED IN ACTION, NOW REPORTED DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. A. E. Harrison, 641056.

MISSING, BELIEVED KILLED IN ACTION.—F/O. S. Paget, 41530; Sgt. G. Sigsworth, 519458; Sgt. W. Tubberdy., 538072.

MISSING.—Act. Sqn. Ldr. R. C. Beaman, 39367; Sgt. T. F. Behan, 626736; Sgt. S. L. Bennett, 742975; Sgt. R. Bracchi, 550921; Sgt. J. E. Brown, 937342; Sgt. J. W. Chamberlain, 651713; Sgt. T. H. Chamberlain, 751740, Sgt. J. Coates, 644895; F/O. D. C. F. Coutts, 41667; P/O. J. C. Dale, 43284; A/C.2 J. G. Forbes, 1109587; Sgt. L. R. France, 580854; P/O. P. E. Gibbs, 85234; P/O. J. H. Gow, 78671; Sgt. A. Gowing-Scopes, 755642; Sgt. J. C. Hulbert, 564868; F/O. P. J. Jenkins, 40713; A/C.2 T. Jones, 1021753; Sgt. J. D. L. Kelly 970149; Sgt. J. Kennedy, 974123; A/C.2 W. C. McDonald, 10705559; A/C.2 M. F. McHugh, 1108072; Sgt. A. J. McMillan, 653055; Sgt. H. G. W. Martin, 744964; Sgt. A. J. Mott, 748276, Sgt. G. E. Price, D.F.M., 741923; Sgt. H. Robson, 509364; Sgt. J. Rowlands, 936289; Sgt. C. G. Sinclair, 968514; Sgt. C. A. Small, 971258; Sgt. K. H. Smith, 745765; Sgt. N. Stephenson, 966808; Sgt. C. T. Swaffield, 935828; P/O. R. W. Trehern, 85672; Sgt. D. Trigwell, 619035; Sgt. W. H. Tunstall, 749318; Sgt. H. S. Wall, 751254; Sgt. K. L. Watson, 754082; Sgt. R. W. Willis, 552094; Sgt. W. B. C. Winning, 740610; Sgt. A. D. Wright, 742730; Sgt. L. A. Young, 742982.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE (WHILE ENGAGED IN NON-OPERATIONAL FLYING DUTIES OR ON THE GROUND THROUGH ENEMY ACTION).—L.A/C. E. G. Halliday, 840911; Flt. Lt. W. O. L. Smith, 37366; P/O. D. M. Vine, 83718.

KILLED ON ACTIVE SERVICE.—A/C.2 W. Aitken, 994628; P/O. J. B. Allen, 83260; P/O. H. J. R. Barker, 88424; Sgt. R. A. Bridgart, 742924; P/O. M. F. C. Buckbarrow, 42557; P/O. L. G. Burton, 78081; F/O. E. A. H. Chapple, 36231; A/CW.1 D. R. Cocks, 894204; Sgt. R. H. Collard, 530468; A/C.1 W. A. Coyte, 845123; P/O. J. H. Dales, 85015; P/O. W. T. Darler, 84044; Cpl. J. M. Dibble; 517805; Sgt. J. Docherty, 910187; A/CW.1 E. M. Drew, 894681; A/C.1 J. R. L. Edwards, 935446; F/O. H. E. H. Featherstone, 41275; Sgt. J. S. Fensome, 747822; Cpl. H. E. Fortescue, 843166; L.A/C. K. C. G. Gilder, 639237; A/C.2 A. E. Goulding, 978247; F/O. J. W. Hamill, 40909; Act. Sgt. L. A. T. Hawker, 904121; A/CW.1 A. D. Hill, 886211; F/O. C. S. Hiniti, 72470; P/O. W. E. Holland, 88413; Flt. Lt. G. R. N. H. Jan, 39102; A/C.2 J. E. Jones, 1104177; F/O. D. M. G. Kirally, 70368; P/O. A. F. Laws, D.F.M., 45092; Sgt. M. A. W. Lee, 742796; Sgt. W. D. Lintott, 755375; L.A/C. E. J. McGrath, 1256401; P/O. R. McK. Mansell, 81646; L.A/C. J. E. D. Marriner, 1060077; L.A/C. W. A. Meller, 622156; A/C.1 G. A. Meridew, 635301; P/O. F. G. Nightingale, 44979; L.A/C. N. H. Owen, 1101265; L.A/C. S. R. Phillips, 1161590; Sgt. R. A. Plowright, 550840; P/O. F. S. Roberts, 86400; P/O. R. A. Robertson, 76463; P/O. C. S. Romback, 87344; P/O. L. M. Sharp, 85241; P/O. L. F. Squire, 86724; Sgt. D. A. Stockton, 740333; A/C.1 G. F. Synnuck, 859653; L.A/C. R. N. Tait, 1165238; P/O. S. J. Thompson, 86402; Sgt. T. D. Vernon, 902317; Sgt. K. A. Worthington, 968104; F/O. F. B. Wright, 72538.

PREVIOUSLY REPORTED MISSING BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—P/O. C. Collings, 77726; Cpl. R. C. Lawson, 521169; L.A/C. A. Lockwood, 520825.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—A/C.1 J. Cranston, 618536; P/O. P. L. Jarvis, 42609; A/C.1 W. Lusty, 631821; Cpl. A. J. Watts, 525119.

PREVIOUSLY REPORTED MISSING BELIEVED KILLED ON ACTIVE SERVICE, NOW REPORTED KILLED ON ACTIVE SERVICE.—A/C.1 W. E. Bezzant, 845153.

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/C.W.1 I. L. Adam, 893922; Cpl. E. C. Brett, 843053; A/C.1 C. E. Bush, 1185861; Sqn. Ldr. A. N. Cole, 37005; Group Capt. E. H. Davidson, C.B.E., M.C.; F/O. F. G. Denman, 42595; A/C.2 V. J. Dixon, 1280291; A/C.2 J. G. Graham, 1304609; A/C.2 G. S. Hunter, 1354615; A/C.1 S. C. Jarvis, 844297; A/C.2 E. W. Jay, 1152433; A/C.1 J. A. Pluckrose, 845814; P/O. K. J. A. Reed, 88707; Cpl. E. W. Salvage, 346990; A/C.2 M. W. Thomson 962652; L.A/C. J. Webber, 746200; A/C.1 C. Wheatley, 863386.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—P/O. D. C. Barrett, 75922; L.A/C. G. S. Broughton, 771504; Sgt. R. Cain, 636553; Sgt. A. Cruise, 746758; F/O. J. P. A. Davidson, 70160; Sgt. W. E. Griswold, 654640; Sgt. J. M. Keddie, 915015; A/C.2 H. G. Keir, 1058773; Sgt. P. R. Peart, 740666; Sgt. A. S. Roberts, 746816; A/C.2 A. J. Stevens, 1259113; P/O. T. E. Timmins, 79164; P/O. C. N. Walker, 78863

SERVICE AVIATION (Continued)

DIED ON ACTIVE SERVICE.—L.A/C. C. M. Andrews, 1262941; P/O. H. W. Aston, 83051; A/C.1 C. H. Baker, 852052; A/C.2 A. R. Brant, 1307846; A/C.2 G. W. T. Coleman, 955493; L.A/C. G. H. Davies, 627299; Cpl. G. Fisk, 344433; A/C.1 C. W. Foster, 631332; A/C.1 H. Gracey, 622561; A/C.1 A. G. Green, 770566; Sgt. W. H. Green, 4183; A/C.2 E. G. Greenway, 755938; A/C.1 A. Greig, 867836; Flt. Lt. R. E. H. Holmes, M.C., 76344; Act. Cpl. N. Hyde, 642519; Sgt. S. D. J. Jenkyns, 581458; A/C.2 J. Kinloch, 995249; A/C.W.2 B. E. I. Knipe, 422674; Cpl. P. C. Le-Croisette, 59468; Sgt. A. P. Milk, 545929; P/O. S. C. Mimmack, 81527; A/C.2 O. Murphy, 1082470; A/C.2 L. W. Pearce, 1180354; L.A/C. R. J. Redmond, 528107; Sgt. R. E. Rule, 562861; A/C.2 A. J. Santer, 1269187; A/C.2 M. A. Scott, 1112023; F/O. F. M. Stephenson, 40956; A/C.1 J. H. Stubbington, 901395; A/C.1 J. E. Wilcock, 913950; L.A/C. R. Winder, 814127.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. R. Ayre, 614211; P/O. D. R. Bird, 79565; Sgt. A. Brown, 746717; P/O. G. C. Brown, 816885; Sgt. R. E. Bush, 749742; F/O. J. W. Collins, 40495; P/O. W. H. Culling, 42698; P/O. H. G. De Forest, 42486; Sgt. J. Gage, 745360; P/O. J. R. Hoope, 79239; Sgt. J. A. Hounslow, 749475; Sgt. E. T. Perry, 935296; Flt. Sgt. F. J. W. Steele, 561898; Flt. Lt. F. H. Vivian, 70699; P/O. P. F. Walker, 85280; Sgt. J. F. Williams, 741584; Sgt. C. H. C. Wright, 905898.

Royal New Zealand Air Force

WOUNDED OR INJURED IN ACTION.—Sgt. R. E. Ashby-Peckham, N.Z.40714.

MISSING.—Sgt. S. V. Smith, A.39942.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. J. F. Coombs, A.401201; Sgt. H. M. English, A.391878.

Correction

CASUALTY LIST NO. 57.

KILLED IN ACTION (WHILE FLYING IN OPERATIONS AGAINST THE ENEMY).

Sgt. P. V. Renal. No. 580978 *not* 480978.

DIED ON ACTIVE SERVICE.

L.A/C. D. J. Ling, 937985.

London Gazette

Royal Air Force

Air Ministry, 21st January.
General Duties Branch.

S. P. Wilkins is granted a permanent comm. as P/O. on probn. (Dec. 22, 1940).

The folg. are granted commns. for the duration of hostilities as F/O. on probn.:—Warrant Officer: (Jan. 2, 1941, Sen. Oct. 1, 1940) W. T. Jeffrey. As P/Os. on probn.:—Tempy. Warrant Officer: (Jan. 6, 1941, Sen. Oct. 1, 1940) J. Watson. Flight Sergeant: (Jan. 2, 1941, Sen. Sept. 16, 1940) N. Pickard. Sergeants: (Dec. 22, 1940) R. R. Presland; (Dec. 25, 1940) D. K. Deyell; (Dec. 25, 1940) G. A. Wilkins; (Dec. 31, 1940) J. E. Russell; (Jan. 2, 1941, Sen. Oct. 4, 1940) W. S. Hillary; (Jan. 4, 1941) J. S. Knowles, W. Foster, D.F.M.; (Jan. 6, 1941, Sen. Oct. 1, 1940) S. C. Braybrooks.

F/O. on probn. J. G. Macdonald (Supplementary List) is confirmed in his appt. (Sept. 18, 1940).

The folg. P/Os. on probn. are confirmed in their appts. (May 15, 1940): J. D. W. H. Clutterbuck, A. N. W. Johnstone, T. S. F. Meadows, P. Morris.

The folg. P/Os. on probn. are confirmed in their appts. and promoted to the war substantive rank of F/O.: (Dec. 23, 1940) P. B. Badean, F. R. Bird, P. F. Blackford, C. M. Burfield, J. F. Hatton, R. L. Hicks, A. D. Livingstone, D. T. M. Lumsden, R. B. Morison, G. H. M. Riddell, D. C. Sharman, K. T. P. Terry, P. C. Thomas, A. E. Whitworth; (Jan. 17, 1941) W. J. Hadnett, M.B.E., C. T. Kimber, D.F.C.

Flt. Lt. W. D. Blackwood, D.F.C. (Capt., R. Tank R.), is promoted to the rank of Sqn. Ldr. (temp.) (Dec. 1, 1940).

The folg. F/Os. are promoted to the war substantive rank of Flt. Lt.: (Sept. 3, 1940) J. M. Wyer, M.B.E., D.S.M. (ret.), D. R. Miller, F. Hume, E. W. Campbell-Colquhoun, E. J. C. Richardson; (Sept. 21, 1940) C. L. Gilbert; (Sept. 22, 1940) L. R. Staddon (ret.); (Sept. 25, 1940, Sen. Dec. 25, 1939) C. M. M. Grece, D.F.C.; (Oct. 5, 1940) I. S. Jameson; (Nov. 10, 1940) D. Bamford; (Nov. 24, 1940) G. R. Leatherbarrow; (Dec. 1, 1940) A. N. Pirie; (Dec. 4, 1940) E. A. Good, W. S. Moore; (Dec. 6, 1940) J. W. Marsden; (Dec. 8, 1940) I. M. Gundry-White, F. B. L. Moore; (Dec. 9, 1940) T. J. E. Lawman, G. S. Fry; (Dec. 10, 1940) C. M. P. Kempster, T. J. Gascoigne, D. B. Pearson; (Dec. 15, 1940) A. J. Loughborough, R. T. Mason; (Dec. 19, 1940) F. W. Snell, D.F.C., A. D. Phillips; (Dec. 24, 1940) J. H. Laughlin, D. J. G. Jackson; (Dec. 31, 1940) C. N. Gardner, J. H. W. Dunn, D. G. Hall.

The folg. P/Os. are promoted to the war substantive rank of F/O.: (Mar. 12, 1940) A. C. Dier; (Sept. 3, 1940) G. W. Salzgeber; (Nov. 18, 1940) F. J. Curtis, D.F.C., H. W. H. Fisher, P. S. Handley, A. Harte-Lovelace, E. A. McLundie, D. R. West, R. J. S. Wootton; (Nov. 25, 1940) E. H. Brown, J. M. Dennis, P. T. Dowding, D. H. L. Farmer, J. Goodhead, V. V. Gress.

SERVICE AVIATION (Continued)

V. R. G. Harcourt, P. E. R. Pike, E. V. G. Broones, C. S. G. Stanbury, G. A. Wolsey; (Dec. 9, 1940) J. C. T. Downey, R. L. J. Fitch, H. M. Jones, E. C. Lane-Sansam, P. W. Peters, D.F.C., W. J. R. Redman, W. R. Sloane, J. H. Steyn, J. A. Walker; (Dec. 16, 1940) R. B. Barrett, F. W. Gilmore, T. C. Stanbury, G. Washington; (Dec. 27, 1940) K. G. Hart, N. H. J. Smith; (Jan. 17, 1941) D. V. Gilmour, D. H. McArthur, D.F.C.

P/O. on probn. C. E. Ashdown is promoted to the war substantive rank of F/O. on probn. (Dec. 1, 1940).

The folg. are transferred to the Technical Branch (April 24, 1940): Air Comdre. (Act. Air Vice Marshal) C. W. Nutting, C.B.E., D.S.C., Grp. Capt. H. Leedham, O.B.E.

The folg. P Os. relinquish their tempy. commns. on return to Army duty: (Nov. 30, 1940) D. P. B. Hagan, 2nd Lt., R.A.S.C.; (Dec. 17, 1940) L. J. D. Haley, 2nd Lt., R.A., T.A.

Errata.

In notifn. of July 16, 1940, concerning Flt. Sgt. C. McK. Dunnicliffe, *for* R.A.F.V.R. *read* R.A.F.

Technical Branch.

The folg. are granted commns. for the duration of hostilities as F/Os. on probn.:—Warrant Officers: (Nov. 6, 1940) T. B. E. Roe; (Dec. 8, 1940) D. G. Perry; (Dec. 19, 1940) R. C. Tucker; (Dec. 23, 1940) G. E. Reep; (Dec. 23, 1940) C. D. Moore; (Dec. 28, 1940) C. C. Eggleston; (Dec. 29, 1940) A. J. Alsop. As P/Os. on probn.: (Dec. 25, 1940) D. P. Davies; Jan. 1, 1941) T. H. Hall. Flight Sergeants: (Nov. 25, 1940) E. J. Partridge; (Nov. 25, 1940) W. B. Dean; (Dec. 12, 1940) J. C. James.

The folg. Grp. Capts. are promoted to the rank of Air Comdre. (tempy.) (Dec. 1, 1940): A. S. Morris, O.B.E., J. H. Simpson, H. Leedham, O.B.E., O. G. W. G. Lywood, C.B.E., R. S. Aitken, O.B.E., M.C., A.F.C.

P/O on probn. H. A. Mooring is promoted to the war substantive rank of F/O. on probn. (Nov. 11, 1940).

Balloon Branch.

Sgt. H. K. Carrol is granted a commn. for the duration of hostilities as P/O. on probn. (Dec. 2, 1940).

The folg. P Os. on probn. are promoted to the war substantive rank of F/O. on probn.: (Nov. 27, 1940) E. C. Bale, A. R. B. Chambers, J. Pinder.

Administrative and Special Duties Branch.

The folg. are granted commns. for the duration of hostilities as F/O on probn.:—Warrant Officer: (Nov. 29, 1940) D. Smith. As P/Os. on probn.: Flight Sergeants: (Dec. 1, 1940), L. Dandy; (Dec. 6, 1940) W. A. Ballett; (Dec. 7, 1940) C. A. Groves; (Dec. 13, 1940) R. Williams; (Dec. 28, 1940) H. Harvey. As Act. P/O. on probn.: Flight Sergeant (Dec. 20, 1940) E. Skinner.

P/O. on probn. L. A. Wright is promoted to the war substantive rank of F/O. on probn. (Sept. 18, 1940).

Equipment Branch.

P/O. on probn. C. S. Reade is confirmed in his appt. (Aug. 17, 1940).

Accountant Branch.

Act. W/O. W. Hooson is granted a commn. for the duration of hostilities as Act. P/O. on probn. (Nov. 22, 1940).

Medical Branch.

The folg. F Os. (Qrmrs.) on probn. are confirmed in their appts. (Dec. 19, 1940): H. E. Vincent, W. D. Richardson.

Flt. Lt. T. C. Macdonald, M.B., Ch.B., is promoted to the war substantive rank of Sqn. Ldr. (Nov. 29, 1940).

Flt. Lt. N. Mackenzie, M.B., Ch.B., relinquishes his short service commn. on account of ill-health (Jan. 17, 1941).

Dental Branch.

Flt. Lt. F. F. Kennedy, L.D.S., is promoted to the war substantive rank of Sqn. Ldr. (Oct. 15, 1940).

Princess Mary's Royal Air Force Nursing Service

Sister Miss J. S. G. Blair resigns her appt. (Jan. 8, 1941).

Royal Air Force Reserve

RESERVE OF AIR FORCE OFFICERS.

General Duties Branch.

The folg. F/Os. are promoted to the war substantive rank of Flt. Lt.: (Sept. 3, 1940) V. Foster, B. W. E. R. Bonsey; (Nov. 3, 1940) G. S. Ogilvie; (Dec. 20, 1940) H. J. Forster.

Royal Air Force Volunteer Reserve

General Duties Branch.

The folg. are granted commns. for the duration of hostilities as P/Os. on probn.:—(Dec. 6, 1940) W. A. A. Sharpe. Flight Sergeant: (Jan. 1, 1941, Sen. Sept. 16, 1940) B. J. Marsden. Sergeants: (Nov. 2, 1940) C. R. Stannard; (Dec. 8, 1940) C. F. Babbage, D.F.M.; (Dec. 12, 1940) A. McDowall, D.F.M.; (Dec. 14, 1940) E. W. Partridge, R. Richards, W. H. Zillessen; (Dec. 21, 1940) A. Y. Evans; (Dec. 22, 1940) H. E. Tappin; (Dec. 24, 1940, Sen. Aug. 28, 1940) C. L. Pashley; (Dec. 28, 1940) N. T. Cooper; (Jan 1, 1941, Sen. Sept. 16, 1940) J. F. Bentley, G. H. Norton, T. M. Scott, S. Trout, B. J. Watson; (Jan. 1, 1940) R. H. Welch. Leading Aircraftmen: (Oct. 23, 1940) R. Bradbury; (Nov. 30, 1940) W. R. C. B. Parker; (Dec. 1, 1940) A. G. Robinson, R. M. Slade, W. R. Burnett, K. S. Flory, A. P. H. Hamilton, F. T. Clayton, W. Hetherington; (Dec. 11, 1940) G. Kidd, A. T. Leaning, L. M. Nelson; (Dec. 12, 1940) B. R. Cook, D. M. Furniss, G. M. Gee, S. W. Gooch, D. M. Sleep, D. V. Varian; (Dec. 14, 1940) D. J. R. Gee, J. V. A. Moira, K. Stevens, J. H. Stigner, H. S. Hopkins, P. D. W. Chappell; (Dec. 14, 1940) R. A. Baseby, G. V. S. Crew, C. K. Fitzgerald; (Dec. 14, 1940) V. D. Beaney, J. D. Berry, W. H. Bleby, B. E. P. Bone, G. Botham, J. R. Cresswell, W. J. Edrich, E. W. Evans, G. W. Gilpin, A. L. Gordon, P. W. Helmore, A. O. S. Jepson, M. P. Loftus, E. C. Maskell, T. F. P. Nisbet, J. Plaistowe, M. S. Smith, P. H. Standfast, P. L. Underwood, M. M. Wayman, I. C. Henry; (Dec. 15, 1940) C. P. Jones, F. Wilson; (Dec. 21, 1940) P. F. R. Graham, N. A. Madders, A. A. Melville-Jackson, G. W. T. Parker, R. W. Witherick, A. S. Carswell, A. W. Ogston, H. T. L. Smith, B. D. Bowes-Cavanagh, R. B. Weber, G. N. Bevan, J. Foster, J. L. R. Long; (Dec. 21, 1940) D. G. Baber, E. D. C. Cooper, G. G. Duff, G. E. Dunfee, W. J. Ewart, D. H. C. Fry, N. A. Mervyn-Smith, L. T. Taylor; (Dec. 28, 1940) L. A. P. Burra-Robinson, E. Lunoe, J. C. Lynn, T. G. Westlake, K. H. Wallis, M. I. Boyle; (Dec. 28, 1940) E. G. Dumont, B. H. F. Templer; (Dec. 28, 1940) T. F. B. Geary, A. V. J. Hardcastle, E. C. Walker; (Dec. 30, 1940) R. J. Curtis, P. J. Horniman, A. W. Ruffhead, R. T. Saunders, H. L. Parry; (Dec. 30, 1940) C. H. Baker, G. F. Ball, T. S. Goocn, E. M. Lloyd, H. J. Phillips, R. West.

The folg. P/Os. on probn. are confirmed in their appts.:—(Oct. 10, 1940) D. C. Shaw; (Dec. 19, 1940) H. J. V. Ashworth.

The folg. P/Os. on probn. are confirmed in their appts. and promoted to the war substantive rank of F/O.:—(Nov. 13, 1940) E. Maxwell-Lipkin, H. F. Welte; (Nov. 18, 1940) G. G. Leeder; (Dec. 10, 1940) P. O. M. Duff-Mitchell, R. D. Elliott, G. R. Green; (Dec. 11, 1940) J. T. Julian; (Dec. 24, 1940) C. D. N. Longley, A. H. Stratford; (Jan. 14, 1941) E. C. Cox; (Jan. 17, 1941) H. E. Day.

The folg. F/Os. are promoted to the war substantive rank of Flt. Lt.:—(Sept. 3, 1940) K. C. Cooke; (Oct. 5, 1940) G. A. Smith; (Nov. 8, 1940) G. Watson; (Dec. 12, 1940) H. Liversidge; (Jan. 9, 1941) M. A. Smith.

The commns. of the folg. are terminated on cessation of duty:—(April 30, 1940) Act. P/O. on probn. F. W. Journeaux; (Jan. 9, 1941) P/O. on probn. B. Campbell.

Errata.

In notifns. of Dec. 20, 1940 *for* A. M. Thomason *read* A. M. T. Noon.

In notifn. of Aug. 27, 1940, concerning Sgt. J. G. D. Strange *for* G. *read* R.

Technical Branch.

The folg. are granted commns. for the duration of hostilities as P/Os. on probn.:—Flight Sergeants: (Dec. 10, 1940) L. B. White; (Dec. 11, 1940) T. L. Walters. Sergeant: (Dec. 17, 1940) T. B. Jones. Corporal: (Nov. 25, 1940) B. Cape.

The folg. P/Os. on probn. are confirmed in their appts. and promoted to the war substantive rank of F/O.:—(Sept. 26, 1940) P. P. Love; (Nov. 17, 1940) J. F. Mortimer; (Dec. 7, 1940) H. C. Barty; (Dec. 10, 1940) W. E. F. Jennings; (Dec. 13, 1940) J. P. L. Corkett; (Dec. 15, 1940) J. Alexander; (Dec. 31, 1940) J. L. Longden, A. H. Lynall.

Balloon Branch.

The folg. are granted commns. for the duration of hostilities as P/Os. on probn.:—Sergeant: (Dec. 21, 1940) L. S. Dunford. Corporals: (Dec. 2, 1940) P. J. Courtier, G. W. H. Harrison, H. J. W. Sergeant; (Dec. 5, 1940) E. C. Tomlin; (Dec. 7, 1940) C. A. Shewell, F. N. Wilson; (Dec. 10, 1940) A. Holland, C. Openshaw; (Dec. 26, 1940) E. S. Beck. Leading Aircraftman: (Nov. 26, 1940) D. P. Murphy. Aircraftmen 1st Class: (Dec. 21, 1940) P. M. Austen; (Dec. 25, 1940) G. J. A. Sparks.

The folg. P/Os. on probn. are confirmed in their appts. and promoted to the war substantive rank of F/O.:—(Dec. 1, 1940) A. R. Tunnah; (Dec. 19, 1940) J. A. Prisley.

Administrative and Special Duties Branch.

The folg. are granted commns. for the duration of hostilities as P/Os. on probn.:—(July 7, 1940) E. G. Ford (this officer's commn. was terminated in notifn. of Nov. 5, 1940); (Sept. 23, 1940) J. N. L. Baker; (Oct. 22, 1940) M. Macneal, F. H. Ziegler; (Nov. 5, 1940) W. A. J. P. Bickford, W. Duncan; (Nov. 20, 1940) G. Dixon; (Nov. 22, 1940) A. J. Brown, M.C., R. Y. Courtney, D. T. Turner; (Nov. 30, 1940) J. C. H. LeB. Croke; (Dec. 6, 1940) E. Sugden; (Dec. 12, 1940) R. G. W. Bragg, E. A. Robertson, R. N. Smith; (Dec. 13, 1940) W. Arblaster, D. H. Ashby, W. J. Barnes, D'A. S. Beck, H. V. Bing, C. N. H. Bowdler, F. A. C. Burditt, M.C., W. C. Caswell, J. R. Clarke, S. G. Cockburn, G. H. Coley, G. W. E. Doughty, A. D. M. Edwards, R. J. Ewins, W. F. Fell, H. H. Few, S. G. Fidoe, H. T. Flintoft, F. Forrest, W. Freeman, E. N. Fuller, K. D. Gordon, H. R. Green, A. H. Gulland, J. Haker, W. R. Harper, C. S. Hartley, A. T. Henman, C. L. Hewett, E. Hill, G. C. Hill, R. W. James, J. R. W. Littlejohn, C. G. Lloyd, A. O. McIntyre, J. McLauchlan, S. Myer, B. A. Nelson, T. H. Nicoll, J. E. H. Nicholson, M. A. O'Cellaghan, D.F.C., C. S. Page, L. V. Parker, W. G. G. Petre, D. W. Phillips, W. Price, H. M. Raleigh, F. A. M. Rawes, R. Rees-Williams, A. E. Richards, C. H. W. Roles, G. B. Segrave, C. S. Silvester, R. S. Silvester, H. E. Taggart, K. A. Tayler, A. R. R. Thomas, W. G. Thomas, F. E. Thornton-Bassett, W. H. Tyndall, H. M. Ward, F. E. Warner, F. S. M. White, H. Wight, E. A. Wood, C. N. Woodbridge, C. N. C. Wynn, T. F. Young; (Dec. 15, 1940) A. S. Brierley; (Dec. 16, 1940) G. D. R. Rathbone; (Dec. 17, 1940) T. A. E. Cairnes, S. J. Pringle; (Dec. 19, 1940) F. N. Beaufort-Palmer; (Dec. 20, 1940) W. G. Arnold, T. E. W. Cherry, W. H. Clark, H. Clegg, A. E. Crawford, H. L. Ellis, B. M. French, H. R. V. Harper, E. Y. Harrison, W. G. Horton, M. J. C. S. Johnstone, R. H. J. Jolliffe, D. G. Jones, E. H. Lee, M. Q. Long, H. Mitchell, M.C., M.M., C. G. Ormiston, M. J. Pittman, L. H. Platts, G. F. Saunter, R. S. Shearburn, C. F. Urry, A. D. Wood; (Jan. 6, 1941) G. E. Cain, D. J. Chittenden, K. A. Hodges, E. T. Lewis, J. E. Smith, S. T. M. Weeden. Corporal: (Dec. 12, 1940) A. S. F. Anderson. As Act. P/Os. on probn.:—(Dec. 27, 1940) A. H. Humphries, P. E. Letts, C. Maclennan, W. A. J. Musson, W. P. D. Wightman. Corporal: (Dec. 20, 1940) P. M. W. H. Clear. Leading Aircraftmen: (Dec. 6, 1940) R. P. Channell; (Dec. 14, 1940) F. R. Woodcock; (Dec. 20, 1940) B. A. Cosgrove. Aircraftman 2nd Class: (Nov. 21, 1940) C. W. Parkins.

The folg. P/Os. on probn. are confirmed in their appts.:—(Sept. 9, 1940) F. St. K. Anderson; (Sept. 19, 1940) A. C. Bencher; (Oct. 3, 1940) E. P. Thompson; (Oct. 20, 1940) P. W. Donner, M.P.; (Nov. 5, 1940) R. F. H. Norman; (Nov. 13, 1940) R. B. Murdoch; (Nov. 15, 1940) J. L. Christie; (Nov. 16, 1940) F. R. Hockney; (Nov. 18, 1940) J. Parry; (Nov. 24, 1940) J. W. Elder; (Nov. 25, 1940) W. Wilson; (Dec. 1, 1940) L. T. Hill; (Dec. 2, 1940) J. W. Warrington.

The folg. P/Os. on probn. are confirmed in their appts. and promoted to the war substantive rank of F/O.:—(Sept. 19, 1940) L. O. Ludgate; (Oct. 4, 1940) J. H. P. Brain; (Nov. 16, 1940) A. M. Thomson; (Nov. 22, 1940) J. E. Pringle; (Nov. 23, 1940) P. Lamboit, A. R. Smithwick, D.S.O.; (Nov. 27, 1940) F. Bagot; (Dec. 4, 1940) F. P. V. Cabot; (Dec. 13, 1940) L. R. Hiscock; (Dec. 29, 1940) R. A. Young.

P/O. W. M. Skeffington is promoted to the war substantive rank of F/O. (Jan. 1, 1941).

WAITING FOR THE SPRING: A pilot officer of No. 601 County of London Squadron takes it easy during the recent quiet spell.

SERVICE AVIATION (Continued)

BURMESE AID: Hurricanes of No. 257 Squadron which has been adopted by Burma. The head-on view emphasises the "cleanness" of the Hurricane and is probably the last thing seen by quite a number of German air crews.

Flt. Lt. F. Larman is transferred to the General Duties Branch (Oct. 14, 1940).

The folg. are transferred to the Technical Branch:—Flying Officers: (Apr. 24, 1940) A. J. E. Forsyth; (July 2, 1940) A. J. L. Collinson. P/Os. on probn.: (Aug. 16, 1940) J. M. S. Adams, J. O. Dykes; (Oct. 13, 1940) L. G. Blundell, L. J. Audus, G. L. Coutts.

Flt. Lt. J. L. Bell is transferred to the Balloon Branch (Jan. 12, 1941).

The folg. resign their commns.:—Flying Officer: (Jan. 1, 1941) W. J. Farquharson. P/Os. on probn.: (Dec. 29, 1940) A. A. Crooke; (Jan. 1, 1941) J. E. Woolley; (Jan. 4, 1941) E. H. Weatherall; (Jan. 15, 1941) I. P. Muller.

The commn. of P/O. on probn. T. R. Sherratt is terminated on cessation of duty (Dec. 22, 1940).

Erratum.

In the notifn. of Dec. 20, 1940 *for* R. Grahame-Bell *read* R. G. Bell.

Meteorological Branch.

The folg. P/Os. on probn. are confirmed in their appts. Aug. 1, 1940, and promoted to the war substantive rank of F/O.:—(Nov. 20, 1940) J. J. Higgins; (Nov. 22, 1940) R. C. Hocking; (Nov 24, 1940) J. E. E. McLaren; (Nov. 27, 1940) F. C. L. Littlejohns; (Nov. 29, 1940) G. H. Jones.

The folg. P/Os. on probn. are confirmed in their appts. Aug. 25, 1940, and promoted to the war substantive rank of F/O.:—(Nov. 20, 1940) F. H. Lowe; (Nov. 24, 1940) W. G. Moore.

Equipment Branch.

The folg. are granted commns. for the duration of hostilities as Act. P/Os. on probn. (Jan. 3, 1941):—R. V. Ashman, E. C. Covsh, A. L. Cunnington, P. B. L. Falk, C. W. Forward, A. J. Frost, P. Gray, F. A. Haime, A. R. D. Kitson, A. R. Lee, F. A. London, B. Miller, J. R. P. O'Neill, D. C. Peters, D. M. R. Piesse, G. Powell-Harper, D. J. C. Prizeman, G. H. Roberts, D. A. Solomon, H. S. Thomson, J. S. Turner, A. S. Whiffin, G. M. Worthington.

The folg. P/Os. on probn. are confirmed in their appts.:—(Sept. 9, 1940) J. Beaton, J. M. Warner; (Nov. 13, 1940) E. G. Bothell; (Nov. 21, 1940) W. M. Skeffington, K. A. Madin.

The folg. P/Os. on probn. are confirmed in their appts. and promoted to the war substantive rank of F/O.:—(Nov. 13, 1940) A. F. J. Copson, G. P. Debono; (Nov. 20, 1940) V. H. Quinn.

Errata.

In the notifn. of Dec. 20, 1940 concerning J. C. Badlancs. *For* Badlancs *read* Ballance.

Accountant Branch.

The folg. are granted commns. for the duration of hostilities as P/Os. on probn.:—(Nov. 18, 1940) G. G. Duddell. As Act. P/Os. on probn.:—Aircraftmen 2nd Class: (Dec. 14, 1940) A. E. Cheshire; (Dec. 14, 1940) F. J. Dryden.

The folg. P/Os. on probn. are confirmed in their appts.:—(Sept. 1, 1940) W. Blair; (Oct. 9, 1940) I. G. Bennett, G. H. Brient, C. E. Brown, W. E. Chapman, G. L. Couch, N. M. W. Harris, W. V. Lush, M. W. Monkhouse, J. H. Sorrell-Cooke, H. A. Simmonds, C. W. Taylor, E. E. Wilding; (Oct. 10, 1940) J. B. Steward, J. A. C. Will; (Oct. 16, 1940) I. L. Cox, C. C. Mepham.

The folg. P/Os. are promoted to the war substantive rank of F/O.:—(Nov. 1, 1940) I. L. Cox; (Nov. 19, 1940) C. C. Mepham; (Nov. 26, 1940) I. G. Bennett; (Dec. 1, 1940) W. V. Lush, M. W. Monkhouse, J. B. Steward, J. A. C. Will; (Dec. 12, 1940) C. W. Taylor.

Medical Branch.

The folg. F/Os. are promoted to the war substantive rank of Flt. Lt.:—(Oct. 12, 1940) A. N. H. Peach, M.B., Ch.B.; (Oct. 24, 1940) B. A. E. Harley, M.R.C.S., L.R.C.P.; J. North, M.R.C.S., L.R.C.P.; (Nov. 28, 1940) D. W. Mahon, M.R.C.S., L.R.C.P.; (Dec. 5, 1940) M. Hamilton, M.B., B.S., M.R.C.S., L.R.C.P.; (Dec. 19, 1940) W. R. Mackie, M.B., Ch.B.; (Jan. 1, 1941) J. G. Moloney, M.B., B.Ch.; (Jan. 9, 1941) J. Evans, B.Ch., M.R.C.S., L.R.C.P.

Dental Branch.

The folg. F/Os. are promoted to the war substantive rank of Flt. Lt.:—(Oct. 2, 1940) J. T. Helford, L.D.S.; (Oct. 12, 1940) F. B. Graham, L.D.S.; (Oct. 31, 1940) E. Allen, L.D.S.; (Dec. 5, 1940) A. N. Paul, L.D.S.; E. C. Redfern, L.D.S., D.D.S.; J. W. Rose, L.D.S.

Auxiliary Air Force

General Duties Branch.

F/O. J. R. Cridland is promoted to the war substantive rank of Flt. Lt. (Jan. 5, 1941).

F/O. L. G. F. Stephen is transferred to the Technical Branch (May 20, 1940).

Balloon Branch.

The folg. P/Os. are promoted to the war substantive rank of F/O. (Dec. 1, 1940):—J. A. V. Hood, C. W. S. Crabbe.

Women's Auxiliary Air Force

The folg. are appointed Assist. Sec./Os. (Jan 8, 1941):—Cpl. Miss R. D. Beaven, A/CW.2 Mrs. W. M. Horsbrugh, A/CW.2 Miss M. G. J. McTurk, Cpl. Miss C. M. Rawcliffe.

Assist. Sec./O. Mrs. C. R. Elliot relinquishes her appt. (Nov. 14, 1940).

Royal Air Force

Air Ministry, January 28, 1941.

General Duties Branch.

The folg. are granted commns. for the duration of hostilities as P/Os. on probn.:—Sergeants: (Dec. 1, 1940) R. N. Peace; (Dec. 20, 1940) W. J. Grisman; (Jan. 4, 1941) J. J. Gale; (Jan. 8, 1941) R. W. P. McFarland, D.F.M., D. W. Mansbridge.

F/O. on probn. W. E. Williamson (Supplementary List) is confirmed in his appt. (June 10, 1940).

The folg. P/Os. on probn. are confirmed in their appts. (May 15, 1940):—G. D. F. Herrtage, T. W. Gudgeon.

P/O. on probn. T. A. Vigors, D.F.C., is confirmed in his appt. and promoted to the war substantive rank of F/O. (Dec. 23, 1940).

The folg. Group Capts. are promoted to the tempy. rank of Air Comdre.:—(Dec. 1, 1940) C. R. Carr, D.F.C., A.F.C., T. W. Elmhirst, A.F.C. (Act. Air Vice-Marshal), L. H. Cockey, J. W. B. Grigson, D.S.O., D.F.C., E. S. Goodwin, A.F.C., R. V. Goddard, C.B.E., D. Colyer, D.F.C.; (Jan. 10, 1941) J. W. Cordingley, C.B.E. (Act. Air Comdre).

The folg. F/Os. are promoted to the war substantive rank of Flt. Lt.:—(Dec. 3, 1940) S. P. V. Bird; (Dec. 8, 1940) R. N. Selley, D.F.C.; (Dec. 10, 1940) F. H. P. Connor; (Dec 24 1940) W. A. Smith); (Jan. 12, 1941) D. C. McKinley, D.F.C., L. E. Ellis; (Jan. 27, 1941) H. G. K. Waring.

The folg. P/Os. are promoted to the war substantive rank of F/O. on dates stated:—(March 27, 1940) D. A. Willis, D.F.C.; (June 29, 1940) B. H. Arkell; (Sept. 3, 1940) D. A. Helsby, J. A. E. Monette; (Sept. 23, 1940) A. F. M. Wilson; (Oct. 21, 1940) S. C. Ladyman; (Nov. 6, 1940) D. B. Bell-Salter, P. L. Dawbarn, M. G. L. Lovell, L. C. Murch, J. F. H. Peters, R. M. Walker; (Nov. 18, 1940) V. G. Penney; (Nov. 25, 1940) D. N. Janes, J. H. Lancaster, E. F. W. McCartan-Mooney, A. J. D. MacLachlan, R. F. Priest, D. W. Whiteman; (Dec. 27, 1940) J. W. E. Alexander, J. R. Urwin-Mann, D.F.C.; (Jan. 23, 1941) K. C. Ritchie.

The folg. are transferred to the Technical Branch (April 24, 1940):—Wing Cdrs.: W. E. James, G. B. Beardsworth. Sqn. Ldr.: C. C. Morton.

The folg. relinquish their short service commns. on account of ill-health:—(Jan. 25, 1941) Sqn. Ldr. E. G. Thompson; (Jan. 28, 1941) F/O. E. K. Kitson.

P/O. J. D. B. Lindsay (Lt. R.A.) relinquishes his tempy. commn. on return to Army duty (Dec. 27, 1940).

Technical Branch.

The folg. are granted commns. for the duration of hostilities as F/Os. on probn.:—Warrant Officers: (Dec. 14, 1940) A. Doyle; (Dec. 20, 1940) E. W. Eades. As P/Os. on probn.:—Warrant Officers: (Dec. 6, 1940) S. E. Craig; (Dec. 23, 1940) A. W. Clements. Flight Sergeant: (Dec. 14, 1940) H. P. E. Dean.

The folg. P/Os. are promoted to the war substantive rank of F/O.:—(March. 26, 1940, Sen. June 26, 1939) A. D. Jackson, L. Kelly.

Administrative and Special Duties Branch.

The folg. are granted commns. for the duration of hostilities as F/Os. on probn.:—Warrant Officers: (Dec. 12, 1940) W. H. E. Vousden; (Dec. 27, 1940) H. T. Harman; (Dec. 30, 1940) L. H. Fuller; (Jan. 10, 1940, Sen. Dec. 18, 1940) J. A. Jarrold. As P/Os. on probn.:—Warrant Officers: (Dec. 27, 1940) W. E. Shaw; (Dec. 27, 1940) W. R. J. Marriott; (Dec. 31, 1940) H. Franklin; (Jan. 1, 1941) S. C. Baker, A. G. R. Green, P. A. Lloyd-Pitt, M.M., D. R. Sexton, H. Wright; (Jan. 6, 1941) A. E. Baldock; (Jan. 13, 1941) R. W. Salmon. Flight Sergeants: (Nov. 7, Sen. August 8, 1940) F. C. Clarke; (Dec. 12, 1940) E. F. Goater, N. Scott; (Dec. 13, 1940) N. A. Clemo; (Dec. 17, 1940) S. Payne; (Dec. 27, 1940) A. F. Harris, F. G. Toone. Sergeants: (Dec. 2, 1940) G. C. Bennett; (Jan 3, 1941) G. Goodsell. Corporal: (Dec. 27, 1940) F. C. T. Terry.

Act. P/O. on probn. H. O. Jones is graded as P/O. on probn. Nov. 8, 1940.

Equipment Branch.

The folg. are granted commns. for the duration of hostilities as P/Os. on probn.:—Warrant Officer: (Nov. 26, 1940) J. V. Evans. Flight Sergeant: (Sept. 14, 1940) J. E. Farrelly. As Act. P/O. on probn.:—Flight Sergeant: (Jan. 3, 1941) J. H. Sanderson.

The notifn. of Jan. 14, 1940, concerning P/O. on probn. B. McA. Hodge is cancelled.

Accountant Branch.

The folg. are granted commns. for the duration of hostilities as P/Os. on probn.:—Warrant Officers: (Jan. 3, 1941) D. C. Coffee; (Jan. 3, 1941) R. Locke; (Jan. 3, 1941) G. E. P. B. Ward. As Act. P/Os. on probn.:—Act. Warrant Officer: (Jan. 3, 1941) J. H. Cook. Flight Sergeant: (July 24, 1940) C. V. Walters.

Royal Air Force Reserve

RESERVE OF AIR FORCE OFFICERS.

General Duties Branch.

The folg. F/Os. are promoted to the war substantive rank of Flt. Lt.:—(Sept. 3, 1939) H. H.

SERVICE AVIATION (Continued)

Ellison, W. A. Hammerton, E. H. Oxley Boyle; (Jan. 6, 1941) A. G. Hall.

The folg. Flt. Lts. are transferred to the Administrative and Special Duties Branch:—(Jan. 14, 1941) A. E. B. Bateman; (Jan. 18, 1941) E. J. Wing.

The notifn. of Dec. 12, 1939, concerning F/O. N. T. Tangye is cancelled.

Technical Branch.

F/O. W. W. Whitehead is promoted to the war substantive rank of Flt. Lt. (April 24, 1940).

Administrative and Special Duties Branch.

F/O. J. A. Craig, D.F.C., is transferred to the General Duties Branch (Oct. 28, 1940).

F/O. T. Herbert is transferred to the Technical Branch (April 24, 1940).

Royal Air Force Volunteer Reserve

General Duties Branch.

The folg. are granted commns. for the duration of hostilities as P/Os. on probn.:—(Dec. 6, 1940) A. E. Saunders; (Dec. 13, 1940) H. P. Lavender; (Jan. 1, 1941) F. J. Cable; (Jan. 3, 1941) K. G. Jones; (Jan. 10, 1941) H. G. D. MacF. Payne. Sergeants: (June 15, 1940) E. B. R. Lockwood; (Nov. 3, 1940) R. J. Rumsey, D. R. Taylor; (Dec. 17, 1940) A. G. Gill; (Dec. 28, 1940) J. M. B. Beard, D.F.M.; (Dec. 21, 1940) M. D. Young; (Jan. 4, 1941) E. Garside; (Jan. 6, 1941) C. T. Bassage; (Jan. 7, 1941) G. A. Day; (Jan. 16, 1941) F. H. Bowden. Leading Aircraftmen: (Nov. 9, 1940) J. D. Wright; (Nov. 17, 1940) K. J. Rich; (Dec. 1, 1940) E. E. Ellner; (Dec. 14, 1940) S. J. Beard, J. W. T. Bromham; (Dec. 15, 1940) D. R. S. Scriven; A. V. Snelling; (Dec. 21, 1940) S. Birch; (Jan. 4, 1941) J. S. Brister, J. M. Graham, R. Kee, J. B. G. King, H. C. Tonge, A. De Q. Walker, S. Le V. Wood, D. B. Peace.

The folg. P/Os. on probn. are confirmed in their appts. and promoted to the war substantive rank of F/O.:—(Sept. 18, 1940) R. Bruce, J. A. MacD. Henderson; (Nov. 18, 1940) W. Towers-Perkins; (Nov. 27, 1940) D. F. H. Bird, A. B. Charles, G. Hipkin, V. W. L. Stanion, D.F.C.; (Dec. 24, 1940) A. L. Hedges.

The folg. F/Os. are promoted to the war substantive rank of Flt. Lt.:—(Sept. 23, 1940) P. B. Newsom Davies; (Dec. 16, 1940) N. W. Burnett; (Jan. 6, 1941) R. G. T. Cooke; (Jan. 13, 1941) J. M. Longley.

The folg. P/Os. are promoted to the war substantive rank of F/O.:—(Sept. 3, 1940) N. Bicknell, D.F.C.; (Oct. 10, 1940) H. S. Lusk; (Nov. 26, 1940) J. W. Lund.

P/O. H. S. Linthwaite is transferred to the Administrative and Special Duties Branch (Jan. 4, 1941).

Act. P/O. D. Tingay is dismissed the Service by sentence of General Court Martial (Jan. 11, 1941).

Erratum.

In notifn. of July 16, 1940, concerning Sgt. R. W. V. Smith. *For* June 9, 1940, *read* June 8, 1940.

Technical Branch.

The folg. Act. P/Os. on probn. are graded as P/Os. on probn. (Nov. 24, 1940):—P. McK. Veale, R. O. Gordon.

Balloon Branch.

The folg. are granted commns. for the duration of hostilities as P/Os. on probn.:—Sergeants: (Dec. 7, 1940) G. G. Oliver; (Dec. 30, 1940) S. T. H. Moore. Corporals: (Dec. 31, 1940) J. B. O'Hagan; (Jan. 1, 1941) R. H. Doyle; (Jan. 4, 1941) F. C. Edmonds; (Jan. 6, 1941) R. Rodman. Leading Aircraftman: (Dec. 16, 1940) E. C. Robinson.

Administrative and Special Duties Branch.

The folg. are granted commns. as Flt. Lts.:—(Sept. 1, 1939) E. W. Barry, Lieut.-Cdr. M. Lloyd-Jones, R.N.R., Lieut. J. D. Loughran, R.N.R. (ret.), Lieut. E. H. Roberts, R.N.R., Lieut. H. L. Rudd, R.N.R. (ret.), Lieut.-Cdr. A. T. C. Cooper, R.N.R., Lieut. R. D. W. Mackay, R.N.R., Lieut. E. W. T. Hardie, R.N.R., W. Batey, J. T. C. Hillman, W. H. Bowen, W. L. Thomas, G. F. L. Coates, W. F. Norvell; (Sept. 6, 1939), J. B. Clarkson; (Sept. 18, 1939) K. Ellis; (Oct. 13, 1939) H. F. G. Dainty; (Oct. 31, 1939) G. Lund Lack; (Nov. 20, 1939) C. J. Lawrence; (Dec. 5, 1939) J. L. Scott.

The folg. are granted commns. for the duration of hostilities as F/O. on probn.:—Warrant Officer: (Aug. 15, 1940) A. J. Cook. As P/Os. on probn.:—(July 2, 1940) R. R. C. James; (Sept. 27, 1940) S. W. B. Foss; (Oct. 1, 1940) C. G. Lucas; (Nov. 1, 1940) L. G. D. Croft; (Nov. 9, 1940) A. E. C. Agate, N. Gregory; (Nov. 22, 1940) C. B. Raithby, D. C. Simpson; (Nov. 29, 1940) R. F. Wagner, W. H. Willan; (Dec. 6, 1940) G. R. K. Beck; (Dec. 8, 1940) R. G. W. Croney; (Dec. 9, 1940) J. S. Lunn; (Dec. 13, 1940) W. G. Burnard-Lewman; (Dec. 16, 1940) G. N. N. Bray; (Dec. 27, 1940) L. Atherton, S. Bendixson, V. C. Bennett, F. W. Black, H. J. Boyden, R. E. Brabyn, F. W. Budd, J. F. Buxton, C. C. Coates, W. G. Cousins, A. H. Crocker, J. L. Crosthwaite, G. C. Curtis, E. C. Davenport, P. Davies, S. H. Davis, D. A. Evans, J. R. Fagan, J. S. Farrington, H. E. Foard, H. S. Gawler, F. C. Giles, M. L. Gillespie, J. L. Grumbridge, C. E. Hanford, C. A. Hemmerdinger, R. A. Henderson, W. B. G. Henderson, G. W. Hickson, A. J. Hobson, N. E. Houghton, H. G. Jones, L. W. Jones, R. C. Lance, L. A. Martin, T. McGregor, E. G. Meadows, S. S. Moore, F. E. Nasmith, C. F. Okell, V. Patman, P. S. Paul, W. J. Pilcher, J. W. Pontefract, H. W. Prescott, L. O Regan, O. E. Ridewood, W. E. Robinson, J. E. Rogers, P. J. J. Savary, L. G. Scott, N. R. Smith, C. Stuart-Harris, J. H. Wallis, A. H. Webb, K. M. Whitworth; (Dec. 28, 1940) E. Barton, C. A. Naylor, R. T. Rogers, J. L. Smith, R. A. Varley; (Dec. 31, 1940) J. T. B. Brader, W. R. H. Brash, T. J. Brooks, G. H. Costigan, E. M. Davies, H. Davies, A. C. Frank, R. Gore-Clough, W. M. Gould, V. O. Hazeldine, H. Jackson, E. J. A. Kenny, S. H. Nicholson, D. H. Ogden, J. G. Ozanne, P. M. Soren, E. D. Strain, H. Webb, C. T. Winterton; (Jan. 1, 1941) S. D. Cooke, (Jan. 7, 1941) R. H. Rose. Sergeant: (Dec. 27, 1940) F. G. Seed. Corporal: (Jan. 3, 1941, Sen. Oct. 28, 1940), S. M. Metcalfe. Aircraftmen 1st Class: (Dec. 30, 1940) T. R. Guthrie; (Dec. 31, 1940, Sen. Sept. 19, 1940) P. N. Labertouch. As Act. P/Os. on probn.:—Sergeants: (Dec. 27, 1940, Sen. Oct. 14, 1940) H. R. Oughton; (Jan. 10, 1941) R. Walker. Corporal: (Jan. 10, 1941) W. V. A. Evans. Leading Aircraftman: (Jan. 10, 1941) D. F. Woods. Aircraftman 2nd Class: (Jan. 10, 1941) C. Connolly.

J. W. Buck is granted an Hon. Commn. as F/O. (Jan. 15, 1941).

The folg. P/Os. on probation are confirmed in their appts.:—(Sept. 9, 1940) G. E. Fearon, D. Goudie, I. W. Parnell, H. V. Rabagliati; (Sept. 12, 1940) H. J. Spencer; (Sept. 16, 1940) P. L. Barrow; (Sept. 19, 1940) W. Man, D.F.C., H. C. T. Browne, A. S. Graves, V. R. Hicks, S. L. Hooper, E. L. Ives, F. F. James, B. E. Lewis, F. D. Lloyd, N. S. Lott, C. J. Hart; (Sept. 26, 1940) A. B. Fanstone, A.F.C., C. G. Barker, G. W. Davis, L. J. Evans, P. W. Evans, C. Fletcher, R. C. Hedger, H. S. Hennah, W. W. Scott, H. Wyllie, O.B.E.; (Sept. 28, 1940) F. A. Blackburn, O. K. Owen.

P/O. on probn. R. A. Cotterell is confirmed in his appt., Sept. 12, 1940, and promoted to the war substantive rank of F/O., Dec. 12, 1940.

The folg. P/Os. on probn. are confirmed in their appts. and promoted to the war substantive rank of F/O.:—(Sept. 4, 1940) F. D. Taylor; (Sept. 9, 1940) W. H. Collander Brown, A. C. Pring, W. A. Wales, S. C. Weir-Rhodes; (Sept. 12, 1940) G. D. Park; (Sept. 14, 1940) G. P. Powles; (Sept. 19, 1940) N. W. B. Bovey, A. A. Caney, A. C. Case, J. K. Chatham, R. L. Cutler, J. A. De Gaye, R. W. Gosse, L. W. Grumbley, W. E. Hunt, G. H. Leonard, D. K. Frazer; (Sept. 26, 1940) F. R. Atkinson, S. A. Barnett, P. V. Burton, A. N. David, A. G. Smalley.

The folg. Act. P/Os. on probn are graded as P/Os. on probn.:—(Oct. 16, 1940) R. F. S. Goebel; (Nov. 8, 1940) H. E. Bi'field; (Dec. 6, 1940) J. M. Barton; (Dec. 17, 1940) C. A. Wimperis.

The folg. are transferred to the General Duties Branch.—Flt. Lt.: (Aug. 15, 1940) C. J. Lewin, F/Os.: (Oct. 14, 1940) J. A. Chubb; (Oct. 22, 1940) H. A. Hince; (Nov. 23, 1940) P. E. Underwood. P/O.: (Oct. 13, 1940) I. C. Strutt. P/O. on probn.: (Nov. 1, 1940) R. C. Stokes.

The folg. are transferred to the Technical Branch:—F/Os.: (July 25, 1940) R. F. Palmer; (Nov. 11, 1940) C. H. G. Soper. P/O.: (May 6, 1940) E. M. Smith. P/Os. on probn.: (May 27, 1940) A. J. F. McDonald; (June 24, 1940) C. P. L. Nicholson, R. W. Money; (June 20, 1940) P. D. McNeil; (Aug. 16, 1940) C. E. Edgley, W. F. Floyd, W. C. Dobson, L. Mackinnon; (Aug. 16, 1940) D. A. Connal, P. W. Baguley; (Aug. 28, 1940) R. H. Payne; (Oct. 13, 1940) E. G. Hubbard, L. Bernstein, G. T. Kelsey, E. Lavington, L. F. Odell, A. Hunt; (Nov. 25, 1940) M. R. Mandviwalla.

The folg. P/Os. on probn. relinquish their commns. on account of ill-health:—(Jan. 24, 1941) R. P. B. D. Radclyffe; (Jan. 25, 1941) C. R. Young; (Jan. 27, 1941) S. G. Rivers, G. W. Thompson.

Hon. F/O. J. A. D. Cotton relinquishes his hon. comm. on cessation of duty, Jan. 13, 1941.

The commn. of P/O. on probn. W. M. McClellan is terminated, Dec. 2, 1940.

P/O. C. B. Burleigh is cashiered by sentence of General Court-Martial, Jan. 10, 1941.

The notifns. in the *Gazettes* indicated, concerning the folg. are cancelled:—In *Gazettes* of Dec. 26, 1939, and Apr. 26, 1940: F. W. Barry, W. Batey, J. B. Clarkson, Flt.-Cdr. A. T. C. Cooper, R.N.R., K. Ellis, Lt. E. W. T. Hardie, R.N.R., Lt.-Cdr. K. M. Lloyd-Jones, R.N.R., Lt. R. D. W. Mackay, R.N.R.; (in *Gazette* of Jan. 5, 1940) C. J. Lawrence, G. Lund Lack; (in *Gazettes* of Jan. 5, 1940, and Apr. 26, 1940) Lt. E. H. Roberts, J. L. Scott, G. F. L. Coates, H. F. G. Dainty; (in *Gazette* of Feb. 27, 1940) Lt. H. L. Rudd, R.N.R. (ret.); (in *Gazette* of Mar. 19, 1940) W. H. Bowen, W. F. Norvell; (in *Gazette* of June 4, 1940) Lt. J. D. Loughnan, R.N.R. (ret.); W. L. Thomas; in *Gazette* of Oct. 22, 1940) J. T. C. Hillman.

The notifn. of Jan. 3rd, 1941, concerning F/O. K. G. P. Hendrie is cancelled.

Meteorological Branch.

The folg. P/Os. are promoted to the war substantive rank of F/O.:—(Nov 24, 1940) A. E. Chapman; (Jan. 15, 1941) J. Bell, C. R. Crinson, G. A. Darlow, B. F. Drew, W. J. Elliott, R. A. Fleming, S. F. Hann, A. V. Hardy, R. C. Honeybone, H. H. J. Leigh-Clare, H. A. Matthews, W. A. Perkins, W. F. Spinks, J. Stephenson, J. E. Thomas, E. H. Varley, H. L. Walker, J. E. Walsh, W. H. Weaver, L. S. Bill, J. C. Lawrence, A. F. E. Cotton, L. R. Morey.

Erratum.

In notifn. of Dec. 31, 1940, concerning V. P. Kelly. *For* Nov. 24, 1939, *read* Nov. 24, 1940.

Equipment Branch.

The folg. P/Os. on probn. are confirmed in their apts.:—(Sept. 9, 1940) L. F. Collins, A. P. Woodyatt; (Nov. 9, 1940) T. C. Boyes, J. P. Orford.

The folg. Act. P/Os. on probn. are graded as P/Os. on probn.:—(Jan. 26, 1940) D. R. Garnham. (Substituted for notifn. of June 4, 1940); (July 24, 1940) W. T. Selley, C. H. Norris; (Sept. 27, 1940) F. E. L. Giuseppi, P. J. Wylie; (Nov. 1, 1940) J. W. Bowron.

The folg. P/Os. are promoted to the war substantive rank of F/O.:—(Nov. 9, 1940) L. F. Collins; (Nov. 10, 1940) A. P. Woodyatt; (Jan. 22, 1941) T. C. Boyes.

The commns. of the folg. are terminated on cessation of duty:—(Dec. 19, 1940) P/O. on probn. R. A. Mitchell; (Jan. 9, 1941) Act. P/O. on probn. D. C. A. McPherson.

Accountant Branch.

The folg. are granted commns. for the duration of hostilities as Act. P/Os. on probn. (Jan. 3, 1941):—S. Barker, A. H. Boughton, T. R. Burton, L. B. Carter, J. R. L. Dougan, L. R. Hawkins, H. J. O. O'Mahony, R. G. Penfold, E. C. Shaw. Corporal: J. A. Whittaker. Leading Aircraftmen: R. K. Fairbrother, C. Kellehar. Aircraftmen 1st Class: B. H. Gallatley, H. W. Norman. Aircraftmen 2nd Class: J. E. Hawken, H. Landin.

P/O. on probn. E. M. M. Henderson is confirmed in his appt. (Nov. 28, 1940).

The folg. P/Os. on probn. are confirmed in their appts., Oct. 9, 1940, and promoted to the war substantive rank of F/O.:—(Nov. 26, 1940) R. P. Gardener, T. R. Gordon; (Dec. 1, 1940) R. Montgomerie, D. Quick, F. J. Searle; (Dec. 12, 1940) H. A. Townshend.

Medical Branch.

The folg. F/Os. are promoted to the war substantive rank of Flt. Lt.:—(Sept. 21, 1940) I. S. Buchanan, M.B., B.S., M.R.C.P.; (Oct. 2, 1940) F. L. E. Musgrove, M.B., B.S., M.R.C.S., L.R.C.P.; (Dec. 12, 1940) W. H. R. Jeremy, M.B., B.Chir., M.R.C.S., L.R.C.P., W. R. May, M.R.C.S., L.R.C.P.

Dental Branch.

The folg. F/Os. are promoted to the war substantive rank of Flt. Lt.:—(Dec. 5, 1940) M. Anson, L.D.S.; (Jan. 2, 1941) G. E. Clarke, L.D.S.

Auxiliary Air Force

General Duties Branch.

The folg. F/Os. are promoted to the war substantive rank of Flt. Lt.:—(Sept. 12, 1940) D. Phillips; (Nov. 1, 1940) A. G. P. Brightmore.

Balloon Branch.

Flt. Lt. T. E. H. Grove, D.S.C., is transferred to the Administrative and Special Duties Branch (Jan. 18, 1941).

F/O. R. C. Crawley is transferred to the Equipment Branch (Jan. 18, 1941).

F/O. E. A. H. Smith relinquishes his comma. on account of ill-health (Jan. 24, 1941).

Auxiliary Air Force Reserve of Officers

General Duties Branch.

F/O. M. M. Irving is promoted to the war substantive rank of Flt. Lt. (Sept. 3, 1940).

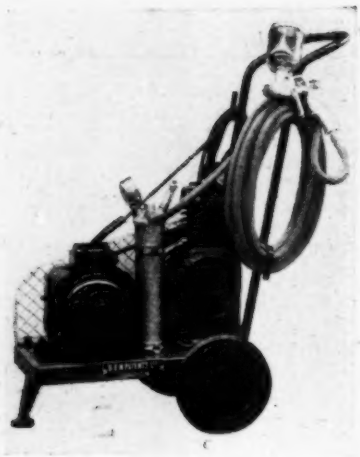
Women's Auxiliary Air Force

The folg. are appointed Assist. Sect. Officers (Jan. 15, 1941):—A/CW.2 Mrs. M. M. S. Bates, A/CW.2 Miss A. G. B. Beckett, A/CW.1 Miss D. C. A. Collins, A/CW.1 Miss R. E. Crichton-Miller, Cpl. Miss K. B. Eades-Eachus, Cpl. Miss J. I. H. C. Grant, A/CW.1 Mss E. T. Hildyard, A/CW.2 Miss J. L. Kirkhope, Cpl. Miss M. M. Lutley, Sen. Sgt. Miss C. M. Martin, Sgt. Miss E. B. Moir, A/CW.2 Mrs. M. L. Pitcher, Cpl. Miss A. Richards, Sgt. Miss E. M. Starkey, A/CW.2 Miss M. E. F. Wheatley.

The folg. Assist. Sect. Os. relinquish their appts.:—(Dec. 21, 1940) Miss M. M. Burghes; (Jan. 8, 1941) Mrs. G. H. Matheson; (Jan. 10, 1941) Mrs. G. G. White.

FOR D.A. DIGGERS: The new badge to be worn by R.A.F. bomb disposal units.

THE INDUSTRY



The B.E.N. portable compressor and spray plant.

Portable Spray Plant

A PORTABLE spray plant is a very necessary piece of apparatus to have handy in the erection shop or flight test hangar. Final touches, which make so much difference to the appearance of the finished article, can be applied without the bother of returning it to the paint shop.

B.E.N. Patents, Ltd., the well-known air compressor and spray plant specialists, have added a model, designated P.3, to their range to meet the needs of those who want a small, portable, single-gun machine. The P.3 is powered by a ½ h.p. electric motor which displaces 2½ cubic feet of air at 700 r.p.m. This is ample power for the job in hand and avoids excessive vibration, overheating and delivery of hot air; troubles which are usually apparent where very small units are concerned. The efficiency of the unit is further increased by a stream of air directed over the copper after cooler from vanes on the compressor flywheel. The normal working pressure of the P.3 unit is 60 lb. per sq. in., but it is also suitable for tyre inflation up to 100 lb. per sq. in. The price is £29 18s. 6d. nett from B.E.N. Patents, Ltd., High Wycombe, Bucks.

Surface Hardening

DAVID BROWN AND SONS, of Huddersfield, draw our attention to their facilities for local hardening of difficult subjects. The system employed is surface hardening by means of an oxy-acetylene process. It differs from the other processes (case-hardening, nitriding, etc.) in that no chemical change takes place at the surface. The hardness is achieved by an alteration of the structure. The surface is heated above the critical point, and rapidly cooled, generally by means of a water jet, to give a structure which is characteristically hard.

Surface hardening does not produce a surface which is as hard or as effectively resistant to wear as those produced by case-hardening, but since no subsequent grinding is necessary it lends itself to the treatment of parts not suitable for case-hardening.

The method of local hardening by means of an oxy-acetylene flame is well known and appreciated in its application to gear teeth, but it is not perhaps so well recognised that sprockets, small machine slides, brake drums, dog clutches, pawls, wheel treads, cams, selector forks and the like can also be treated in an equally successful manner.

Providing that the material is correct, and the work is suitable for treatment by this process, there is no reasonable limit to the size and type of job which can be treated. Where the work is too bulky to be accommodated in a tank machine, special portable equipment is employed. Parts that have been previously case-hardened and have become soft owing to heat or wear can also be re-hardened providing that the depth of carburisation is not worn away.

These facilities, which include the "Shorter" process and plant, realise to the full all possibilities of flame hardening.

A folder by the title of Surface Hardening is available for those interested in the process.

Paint Removing

PRIOR to 1925, paint stripping meant the use of either a blow-lamp or a solution containing strong acids or alkalis. In that year the Quickstryp Chemical Co., Ltd., of Wilton Street, Bradford, patented neutral paint removers. The advantages of these neutral strippers are obvious, since it means a complete absence of injury either to the article or the operator. What is not quite so obvious is the efficiency with which they work. The makers claim that their non-volatile Quicker-Stryp No. 32, for instance, will keep wet and working longer than any other comparable type, and that it will soften the hardest high-temperature stoved enamel with only one application, doing the whole job quicker than a man with a blow-lamp.

Where the aircraft industry is concerned, one of the outstanding advantages of the use of these neutral liquids is that they can be used on such delicate things as dural airscrew blades without damage to the anodic film.

Petrol-proof Boost Gauge

A NEW boost gauge, which is claimed to be petrol-proof, has been designed by the Korect Depth Gauge Co., Ltd., Purley Way, Croydon.

The difference in pressure in the intake manifold is led into a membrane hermetically sealed from the instrument case. From this membrane the resulting movements are conveyed via a second diaphragm to the indicating mechanism. It is the confinement of petrol-laden vapour within the membrane which prevents the spirit affecting the recording mechanism of the instrument and eliminates discolouration of the dial and misting up of the glass. Obviously, with a boost gauge of this design no fuel trap in the pipe line is necessary; the instrument weighs 7¼ oz.

NEW COMPANIES

SIMMONDS GROUP PENSION CO., LTD.—Registered as a private company on December 27, with a nominal capital of £100 in 100 shares of £1 each. The objects are: to act as trustees of pension and benevolent funds, etc. The directors are: Oliver E. Simmonds, M.P., Dunsborough House, Ripley, Surrey, director of Simmonds Aero Accessories, Ltd. (permanent director and chairman of Board); Gladys E. Simmonds, same address, director of same company; Cyril F. Simmonds, solicitor; Noel J. Dodd, C.A.; Edward R. Robertson, engineer; Leonard G. Oxford, engineer; Rose G. Taylor, office manager; James A. Porter, works foreman. Solicitors: Simmonds and James, 5, Staple Inn, W.C.1.

MACKS (SALVAGE), LTD.—Private company. Registered December 20. Capital £100 in 100 shares of £1 each. Objects: To carry on the business of contractors for the transport, haulage and storage of "Salvage" (i.e., materials saved or left over from the destruction of aircraft or of any buildings or contents thereof, or of any machinery, plant or equipment), etc. The directors are: Arthur G. Mack, "Buckstone," Camlet Way, Hadley Wood, Herts (director of Macks (Hauliers), Ltd.); Peter Mack, 266, Green Lanes, N.4, wholesale fruit merchant. A. G. Mack is chairman and permanent director. Solicitor: W. E. Wise, 24, Ely Place, E.C.1.

INCREASE OF CAPITAL

PAK PARACHUTE CO., LTD., Westexe, Tiverton, Devon.—The nominal capital has been increased by the addition of £5,000 in £1 ordinary shares beyond the registered capital of £5,000.

AERONAUTICAL PATENT SPECIFICATIONS

(*Published November* 21, 1940.)

1939.

9055. BURNELLI AIRCRAFT CORPORATION. All-wing aeroplanes (528,180).

11008. BRISTOL AEROPLANE CO., LTD., and MAYER, F. Control systems for aircraft (528,249).

11793 DE HAVILLAND AIRCRAFT CO., LTD., and THOMAS, F. M. Cooling of aircraft engines (528,188).

12064. WILLANS, P. W., and PLESSEY CO., LTD. Radio direction - finding apparatus (528,061)

12611. KLEMM, H. Outer skin for aircraft and other light construction bodies, and process for the production thereof (528,086).

12659. SPERRY GYROSCOPE CO., INC. Distance or height-measuring apparatus, more especially for aircraft (528,105).

12680. REID AND SIGRIST, LTD., and BOWER, C. Cabin or cockpit covers for aircraft (528,130).

(*Published November* 28, 1940.)

1939.

6418. SPERRY GYROSCOPE CO., INC. Gyroscopic horizons and verticals (528,569).

12786. STANDARD TELEPHONES & CABLES, LTD., and WAGSTAFFE, C. F. A. Radio direction-finding systems (528,514).

13811. MARTIN, J., and MARTIN-BAKER AIRCRAFT CO., LTD. Protector cap or nosecap for use with blast tubes for machine-guns in aircraft, and for like purposes (528,528).

14118. BAYERISCHE MOTOREN WERKE AKT.-GES. Lubricating device for aircraft engines (528,656).

16192. MARTIN, J., and MARTIN-BAKER AIRCRAFT CO., LTD. Blast tubes for use with machine-guns on aircraft and for analogous purposes (528,559).

(*Published December* 5, 1940.)

1939.

13573. FAIREY AVIATION CO., LTD., and LOBELLE, M. J. O. Construction of aircraft (528,911).

14185. TAMPIER, R. Lift-increasing devices for aircraft (528,808).

14422. POTEZ, H. C. A. Two-stage compression arrangement for aircraft engines (528,773).

(*Published December* 12, 1940.)

1938.

11092. SIEMENS APPARATE UND MASCHINEN GES. Automatic steering devices for aircraft (529,231).

24231. CHOWN, W. R., and HILLS & SONS, LTD., P. Target aeroplanes (528,961)

1939.

10136. FAIREY, C. R. Safety devices for aircraft (528,963).

11376. BONSTOW, T. L., and MARGOLIS, A. E. Assisted take-off of landplanes (529,243).

14125 BRISTOL AEROPLANE CO., LTD., and NIXON, F. Air-intakes for aircraft engines (529,057).

15095. BOULTON PAUL AIRCRAFT, LTD. (SOC. D'APPLICATIONS DES MACHINES MOTRICES). Sighting means for guns (529,078).

15147. MERCIER, J. Hydraulic accumulators adapted for use on aircraft (529,112).

15587. LUNDBERG, B. O., and SCHWARZLOSE, W. A. E. Machine-guns (529,261).

15631. ARADO FLUGZEUGWERKE GES. Float for aircraft (529,269).

16058. GRIFFITHS, E. J. Aircraft landing gear (529,087).